Largest Sale of Any Aviation Magazine

POPULAR AVIATION

Combined with **Practical Mechanics**

hat I Think About (page 348)

IRPLANE BOMBERS

by **Gen. Wm. Mitchell**

●

ow to Convert (page 373)

ORD "A" ENGINES

by **B. H. Pietenpol**

See Page 356

DECEMBER

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NOW
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SMARTER looking, faster than any stock ship Heath has ever offered, this new model C. N. Center wing has all the lines, style, and beauty of high priced racing ships. With her Continental A-40 motor she has been clocked at 90 m.p.h.—fast enough to get you anywhere in a hurry and fast enough to win first prize money in many a race.

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For those who prefer, Model C. N. A-40 can be had, Flyaway, Niles, Michigan, powered with Continental Motor $1,224.00. Air wheels as shown $25.00 extra. Built by experienced pilot mechanics, these ships have the same splendid finish found in much higher priced planes.

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The beautiful Bayles, Gee Bee Racer illustrated (right) is only one of the large squadron available—all equally complete and realistic.

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3. Hell Diver—Bomber
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5. Hawk's Famous Mystery Ship
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Choice of any Ships listed { 15 in. Wing Spread sets only **99c** each, Postfree. / 30 in. Wing Spread sets only **$1.99** each, Postfree.

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Are the most popular and the very latest thing in model planes. All important contests are scheduling compressed air events with valuable prizes. Think of it! 212 seconds, using a bicycle pump instead of an egg-beater winder. These scientific, real power driven models appeal strongly to the intelligent American boy, with their realistically droning motors and record flights. As this field is relatively new, you (or your son) may be the next to achieve this world-wide honor.

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Have broken the U. S. and world records so frequently that it is difficult to keep up-to-date!—61 SECONDS—91 SECONDS—136 SECONDS—and NOW—a customer flying in California State Championship Model Contest set up two new OFFICIAL WORLD RECORDS: 212.2 SECONDS, hand launched; and 146.8 SECONDS, rise off ground! (if not broken since going to press!)

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The introduction of Hoosier Whirlwind Compressed Air Equipment (after 5 years of research and engineering) is responsible for the biggest advance in model airplanes since the inception of balsa wood. These featherweight motors have ample power to loop large 6 ft. to 8 ft. models and to fly equally well open or cabin jobs up to 10 ft. wingspread. They have the durability of a truck motor, yet are made with the precision of a watch. (Fine for model boats, too!)

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BIG BRAND NEW CATALOG

Listing latest "red hot" items, including Microfilm, biggest assortment wheels, insignia, kits of the very latest championship models, (including record compressed air model), autogyro, real racing plane pictures, etc. 10c each stamps or coin (no free copies).

LOOK! BIG 5-IN-KIT $$$ SAVE $$$

Over 110 items for model making—less than wholesale cost! Includes over 50 lengths assorted sizes balsa sticks, and veneers, sample new MICRO-FILM, variety reed, bamboo, washers, aluminum tubing, 30 feet 3 sizes rubber, 5 pair wheels, 3 kinds tissue, 8 official insignia in 3 bright colors (pairs), finished true pitch propeller and 4 selected blanks, 5 newest light type "Dural" and strong steel thrust bearings, 5 lengths 5 popular sizes finest quality plated (non-rust) music wire, supply special paper cement and instructions, HOOSIER GLU, plus big flying model plan—parts for 5 complete models and then some! List value $2.85. Makes a dandy present! **Only 99c, postfree or 2 kits (5-IN-1 with different plans) $1.89.** (Foreign—add 10c per kit.)

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Freshest full skeins—over 300 feet—with supply PERU SUPER LUBRICANT—used by the champions—win contests! 1/20 in. square, **59c**; 3/32 in. or ⅛ in. flat, **69c**; 3/16 in, **99c, Postfree.**

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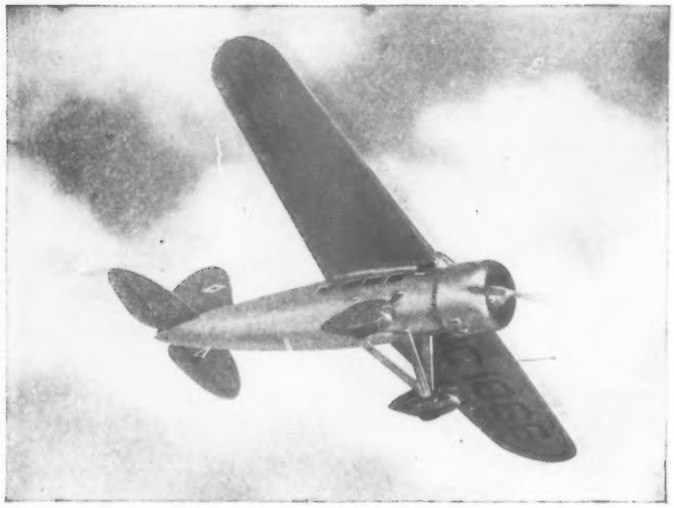

Here's the entire Cleveland-Designed Line—including most every possible type of land and sea plane. Every model aircraft builder is making plans now for the Cleveland-Designed Models he wants for Christmas. Make up your list from this magnificent array. Study every model carefully. Decide on the ones you want. Prices this Christmas are lower

LOCK-HEED VEGA

An instantaneous hit the first time it was displayed—for its remarkable realism. Compliments galore have come in—not only for its startling beauty and sleekness of line, but its swift, graceful flights as well. This model follows no particular Vega, but the rich, striking color scheme is that of Amelia Earhart's red and gold monoplane in which she recently flew the Atlantic. Be sure this is on your list. Span is 30¾"; length 21"; weight 3.7 oz. Colored brilliant red wings, tail surface and wheel shoes; everything else gold except black details, for which ink may be used. Kit is complete—as are all Cee-Dee kits—and even includes the New Enamel Dopes and printed and numbered balsa. Complete **Kit SF-24, only $2.95.**

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1930 G. Lakes Sport Trainer
Span 20"; length 15¼"; weight 1.2 oz. Colored international orange and black. **Kit SF-1, $2.50.**

1929 Mystery Ship
Span 22"; length 15⅝"; weight 2.2 oz. Colored red and black. **Kit SF-2, $2.95.**

1918 DH-4 Battleplane
Span 31¾"; length 22¼"; weight 3.9 oz. Colored yellow and olive drab. **Kit SF-3, $3.50.**

1916 Curtiss JN.4.D
Span 32⅝"; length 20¾"; weight 2.7 oz. Colored yellow, details black. **Kit SF-4, $2.95.**

1931 Doolittle's Laird S.S.
Span 15½"; length 13¼"; weight 1.7 oz. Colored yellow and green. **Kit SF-5, $2.50.**

1931 Polish P.6 Fighter
Span 25⅛"; length 17½"; weight 2.5 oz. Colored all silver. **Kit SF-6, $2.95.**

1917 Sopwith Camel
Span 20⅝"; length 14¼"; weight 1.8 oz. Colored orange and green. **Kit SF-10, $2.50.**

1917 Richthofen's Triplane
Span 17⅜"; length 13¼"; weight 1.8 oz. Colored all red. **Kit SF-14, $2.50.**

1918 Fokker D-7
Span 21⅞"; length 17"; weight 1.8 oz. Colored green and orange. **Kit SF-15, $2.50.**

1917 Albatross D-3
Span 22"; length 17¼"; weight 1.9 oz. Colored orange and blue. **Kit SF-16, $2.50.**

1931 L. Bayle's Gee-Bee
Span 17½"; length 12"; weight 1.4 oz. Colored yellow and black. **Kit SF-17, $1.50.**

1930 Howard Racer
Span 15"; length 13¼"; weight 1.3 oz. Colored all white. **Kit SF-18, $1.00.**

1931 Supermarine S6-B
Span 22"; length over all 21⅝"; weight 2.9 oz. Colored silver and blue. **Kit SF-19, $2.50.**

1930 Hawker Fury
Span 22½"; length 19¾"; weight 2.6 oz. Colored all silver. **Kit SF-20, $2.50.**

1932 Curtiss Hawk P.6E
Span 23½"; length 16¾"; weight 2.3 oz. Colored yellow and green. **Kit SF-21, $2.50.**

1932 Curtiss F9C-2
Known as Akron Fighter. Span 19¼"; length 15¼"; weight 2.2 oz. Silver and blue. **Kit SF-22, $1.95.**

1932 Boeing P-26
Formerly XP936. Span 21¼"; length 17⅜"; weight 2.5 oz. Yellow and olive drab. **Kit SF-23, $1.95.**

FEATURES

1. Models are of the built-up All Balsa, Jap tissue construction, rubber strand motored, and flown by efficient easy to assemble C-D propellers.
2. The kits are complete even to colored dopes, except detail black; when very little is needed, black ink is recommended.
3. All necessary machine work completed, only handwork left to be done.
4. Kits include full size drawing with note instructions right on them. Simply trace or cut out patterns, mark on the balsa wood, cut them out and assemble model right on the drawing, except SF-22, 23, 24 & 25.
5. Many types of construction employed—you learn much building C-D models. Details are all worked out, not left to your imagination.

Kits SF-22, 23, 24 and 25
contain Balsa already printed out and numbered. Not a few pieces rubberstamped—but ALL the irregularly shaped parts printed out. Merely cut out numbered parts and assemble right on drawing. They're Great! Nothing else like 'em!

1931 Curtiss Helldiver
Span 23⅞"; length 16½"; weight 2.7 oz. Colored blue and silver. **Kit SF-7, $3.50.**

1931 Boeing P 12 C
Span 22⅜"; length 14½"; weight 2.0 oz. Colored green and yellow. **Kit SF-8, $2.95.**

1917 SE-5
Span 20"; length 15¼"; weight 1.9 oz. Colored natural or ivory. **Kit SF-9, $2.50.**

1917 Experimental Quad
Span 20⅝"; length 18¼"; weight 2.3 oz. Colored red, white and blue. **Kit SF-11, $2.50.**

1916 Col. Bishop's Scout
Span 19⅝"; length 14"; weight 1.8 oz. Colored silver and blue. **Kit SF-12, $2.50.**

1917 Rickenbacker's Spad
Span 19¾"; length 15¼"; weight 2.0 oz. Colored yellow and green. **Kit SF-13, $2.50.**

Guarantees

1. Everything is as advertised or money refunded. For other reasons a 50c charge is made for returning kits; west of the Mississippi, 75c.
2. A-1 quality. Defective parts replaced free of charge—advise us before returning.
3. Kits are priced low for their value, and shipped *postfree* everywhere.
4. Immediate, personal attention given to all orders. Insurance, 5c per kit extra.
5. When colored, finished models look far better than photographs shown here. But please remember, these are kits, of materials, not knock-down sets, or complete planes, for we sell no finished models.

There's No Finer, More Helpful Hobby for Airminded folks than to build Cleveland-Designed Models

Cleveland's New Hobby Store

Model builders of Cleveland and all Northern Ohio are invited to come and see our new modern retail store—bigger, better, brighter—located at the corner of W. 57th and Bridge Ave.—just a few doors north of our old store location. Easily accessible from Public Square or any point in Cleveland. Right on Madison car line—near Detroit, Lorain and Harvard-W. 65th car lines, also Franklin bus. When driving—these roads, Detroit, Franklin, Bridge, Madison and Lorain Avenues to W. 57th. Also from Harvard-Denison or Clark Avenues to W 65th St., then on Bridge Avenue to W. 57th St. The complete line of finished C-D models displayed—all those whose photographs are shown on this sheet, our entire line—also many very fine toys and hobby supplies for young and old, at prices to suit any pocketbook. Store hours every day, except Sundays and holidays, from now until Christmas, 8:00 A. M. to 6:00 P. M., except Tuesdays, Thursdays and Saturdays from 8:00 A. M. to 8:30 P. M. (Factory still at the same address.)

CLEVELAND MODEL & SUPPLY

Great "Cee-Dee" Line of 45 Flying Model Kits

than ever. Don't wait till the last minute. Go to your dealers early—if he hasn't the kits you want in stock—tell him to order them for you. Accept no substitute—for the "just as good" models are never as good as the original Cleveland-Designed authentic, all-flying models. Order early—and be good to yourself.

CURTISS A-8 ATTACK PLANE

A model packed with thrills in building, and thrills in flying. Amazing in the details it embodies—even instrument boards. Exceptional in flying flash, maneuverability, and accoutrements as America's new "terror of the sky" is, experienced airmen are really astonished at the masterly way so much of this realism has been engineered into this authentic Cleveland-Designed model. It's detailed to the last feature — machine guns, windows, gas tank, wing flaps, dummy motor incidentals, venturi, pilot tubes, etc., etc. ALL balsa wood is printed ort and numbered. This Kit, as all Cleveland-Designed Kits, contains everything needed (excepting touch-up black, for which purpose ink or black dope may be used). Also includes the new Cleveland Enamel Dopes, which give it that remarkable appearance everyone is talking about. Authentic ¾" scale. Span 33"; length 24"; weight 4.7 oz. Colored Army yellow and olive drab. Complete, **Kit SF-25, only $2.95.**

Authentic ⅜-in. Scale Large Outdoor Profile Fuselage Models

1932 Boeing Bomber
Span 29"; length 19⅜"; weight 2.1 oz. Colored yellow and green. Kit JSF-1005, $2.50.

Check and Double Check

All pictures on these 2 pages are of actual "Cee-Dee" Models. We never use photos of the real ships—occasionally we use backgrounds for realism. Every "Cee-Dee" Model is a flying model—years ahead! All "Cee-Dee" Kits are complete (e-o-m-p-l-e-t-e!). They represent a value far beyond their low price.

Cleveland Robin
Span 33"; length 20". Colored yellow and red. **Kit FL-201, $1.95.**

Cleveland Sirius
Span 34¼"; length 23". Colored red and black. **Kit FL-202, $1.95.**

Cleveland Bull-Pup
Span 36"; length 24". Colored green and yellow. **Kit FL-203, $1.95.**

Beginners ⅜-in. Scale Models

Two Training Gliders
Spans 13⅜" and 18¼". Colors red, white and blue. Kit FL-101, 85c.

Gift Givers!
To help you in choosing—beginners (over 11 years) should build one of the FL-100 or FL-200 models. If a little harder start is desired, then the Howard Racer, the Gee-Bee or the Curtiss F6C-2 could be undertaken. Others almost as simple to build are the FL-300 line, or SF-1 2, 5, 9, 10, 11, 13, 15 and 16.

1930 Boeing Mail Plane
Span 16⅜". Colored silver, white and blue. **Kit FL-108, 85c.**

1930 Great Lakes Trainer
Span 10". Colored orange and black. Kit FL-102, 85c.

1929 Eaglerock Bullet
Span 14⅜". Colored blue and red. **Kit FL105, 85c.**

1929 Curtiss Robin
Span 15⅜". Colored yellow and orange. **Kit FL-109, 85c.**

1932 Fleetster Monoplane
Span 16⅛". Colored all green. Kit FL-103, 85c.

1930 Curtiss Hawk
Span 11⅝". Colored yellow and green. Kit FL106, 85c.

1932 Vought Corsair
Span 13½". Colored silver, white and blue. **Kit FL-110, 85c.**

1932 Boeing Fighter
Span 11½". Colored silver, white and blue. Kit FL104, 85c.

1929 Mystery Ship
Span 10⅝". Colored red and black. **Kit FL-107, 85c.**

1931 Lockheed Sirius
Span 16¼". Colored orange and black. **Kit FL-111, 85c.**

⅜-in. Scale Semi-Profile Fuselage Models

Cleveland Amphibian
Span 27"; length 16½"; weight 1.2 oz. Colored yellow and blue. **Kit FL-301, $2.50.**

Cleveland Trimotor
Span 29"; length 19"; weight 1.1 oz. Colored silver and blue. **Kit FL-302, $2.50.**

Cleveland Pirate Bomber
Span 28"; length 16¾"; weight 1.6 oz. Colored yellow and green. **Kit FL-303, $2.50.**

WARNING!

Cheaper Kits now on the market are not cheap when only half enough material is supplied accompanying a semi-finished inaccurate and unauthentic drawing.

Cleveland Commodore F. Boat
Span 37½"; length 22⅝"; weight 2.1 oz. Yellow and green. **Kit FL-304, $2.50.**

1931 Curtiss Falcon
Span 14¼". Colored yellow and green. **Kit FL-112, 85c.**

Special Surprise! Don't Miss It!

If you have already sent for the latest CME Technical Bulletin for Cleveland Model Engineers, this special surprise will come to you without further writing. But if you haven't yet sent for the Bulletin with its complete news, details and clear pictures of the entire "Cee-Dee" Line of Flying Model Aircraft Kits, and reasonably-priced A-1 quality supplies, do it at once. Be sure to enclose 5c to defray mailing expense, together with your name and address. Don't delay. Send AT ONCE.

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Please rush the following order, for which I am enclosing $.....

Kit No.	@	Kit No.	@
Kit No.	@	CME Bulletin	5c
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Print Name.....

Address.....

City and State.....

Age.....yrs; Model Experience.....yrs.

My Store Dealer's Name is.....

.....City.....

I am pinning to this coupon a list of models I would like to see Cleveland-Designed (Note: Advise us every 3 months.)

Ask your Dealer for these "Cee-Dee" Kits

If he hasn't them, he'll be glad to get them for you. Ask him to do this for you and your friends who want to purchase authentic "Cee-Dee" Flying Model Aircraft Kits right there in your town. If ordering direct remember Special Delivery Mail Service is 15c extra per kit. Two or more Kits, 25c extra. Kits SF-3, 24, and 25 require 25c each extra. (Foreign Customers: On all orders, send 15 per cent extra, except to countries where transit charge applies, then send 30 per cent extra. Ask your postmaster. Customs must be paid by purchaser upon arrival.)

COMPANY, *Model Engineers Since 1919*
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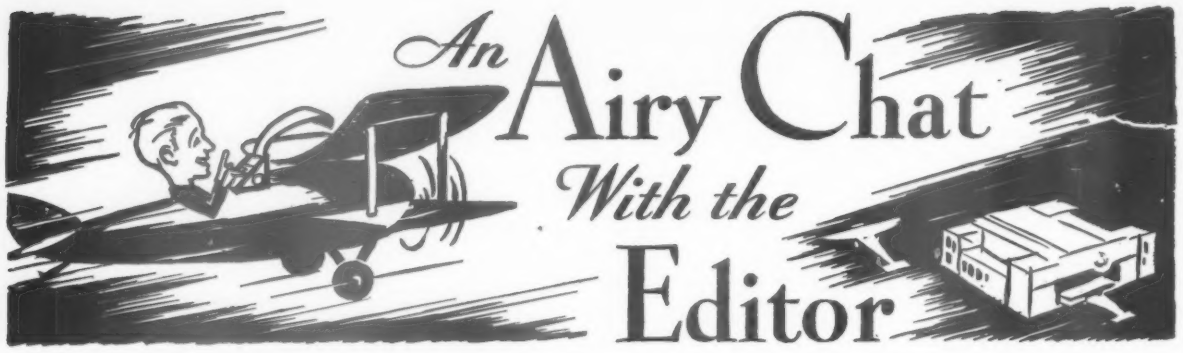

An Airy Chat With the Editor

THERE is no doubt but what the general public has become increasingly air-minded during the past summer. Reports from the large passenger carrying airlines indicated a very remarkable improvement in their passenger business during the past summer in spite of the unfavorable financial situation.

Under the stimulation of this success, several of the larger airlines are building new ships that are both larger and faster than those that have been used up to date. The cruising speed of these new passenger carriers is considerably higher than the top speed of the old ships, and just what influence this will have on a further increased passenger business is difficult to forecast. The public have been educated to demand more speed and now they are getting it—and plenty of it.

* * *

A THREE-CENT postage rate has not discouraged our correspondents in the least, in fact, about 50 per cent more letters have been received this month than last year at this time. They write on all sorts of subjects and have many daring projects in view, but one and all, they are friends and buddies of POPULAR AVIATION. This friendly spirit is always a great inspiration to the staff of this magazine, and to say that we appreciate the kindness of our readers is putting it mildly.

* * *

THE Kill Devil Hills Memorial Association are going to pull off a big celebration at Kill Devil Hill, N. C., in commemoration of the Wright Brothers' first flight which occurred thirty years ago. The government has erected an impressive monument at this historic spot and the associaton will issue a complete and authoritative book giving the true history of the events that led to this successful culmination of the Wrights' labors in the field of aviation. Orville Wright is the only surviving brother, Wilbur Wright having died many years ago after they had achieved success.

* * *

WE HAVE had all sorts of debates, controversies and arguments in POPULAR AVIATION on all sorts of subjects, and now we have another one staring us in the face. No, it is not on the subject of war aces this time—it is on the subject of meteorology.

This promises to be a real issue if the contestants finish with as much steam as they have started with. The ruckus is all based upon the proposition of whether it is advisable to fly around a low pressure area with the wind on the tail of the ship or the other way about. If everything continues favorably, as it seems possible at the present time, we will turn them loose on you next month.

* * *

THIS calls to mind another disturbance at our office. The conductor of this column, J. B. R., and friend Herman Bollin, who artisticates our covers, have pooled their resources into another "mystery ship", or at least a model of a mystery ship.

This flying "Flap-doodle" is supposed to combine all of the desirable characteristics of a speed-buggy. We intended to run the story this month, but for lack of proper words with which to express ourselves, we have decided to postpone the revelation until next month. This true inside history of a knock-out mystery ship will bear the title, "Just Another Brainstorm."

* * *

RADIO is certainly getting to be the big aviation interest at the present time. Everybody that we meet is considering some sort of a radio installation next spring. There are one tube radios, two tubes, three tubes and four tubes of all sorts and sizes, and working on all sorts of wavelengths from 5 meters up. If all of our prominent bird-men take to the air with their headsets on, there will be a lot of interesting developments to talk about—you bet.

* * *

AND here we would like to make a few remarks for the benefit of authors and photograph vendors who intend sending in manuscript and pictures to POPULAR AVIATION. Please, oh please, put your name and address on each manuscript and on the back of each photo.

It is almost impossible to keep track of these things unless you do this, for the papers come pouring into this office in a deluge. In ninety per cent of the cases, delay in the return of manuscript or pictures, in the publication of stories or in mailing out checks is due to the writer's own negligence in writing his name and address on his stuff.

* * *

IT DIDN'T take long for our Barter and Exchange Department to win a lot of friends. Just look at the length of the column this month after only 15 days of existence. You can find a whole lot of things that you want, in this column and by the simple method of exchanging you can avoid an expenditure of actual cash. They're offering big stuff this month, including lightplanes and Fords.

* * *

THEY have been hard at work hopping the Atlantic Ocean all summer. I wonder if some guy will try to fly over the briny this winter, just to vary the monotony of things.

* * *

HERE'S a letter from George K. Gregg, Altoona, Pa., who writes in to tell us about his private peeve in aviation. So sit tight while he narrates his tale and hold your ears.

Anything that gives me a swell pain is to hear some war vet argue with another war vet on how some ace was shot down, neither of these parties knowing what he is talking about.

According to their way of thinking, the War Department records are all wet, and they are the only ones that know anything about the war. And when some other guy horns into the game with the dope he copped out of some book, it makes me go blooey.

Half of these Dodos that are always arguing against permanent records make me think of a guy in Chicago trying to referee a fight in New York. The way I think is this, if an author goes to the trouble of looking up the facts in the records, then these chair warmers should be satisfied.

Mebbe you're right, G. K. G., mebbe so, but then there is another side to the story. Occasionally one of these birds does turn up who knows what he is talking about, and it would be just too bad if we didn't listen to him.

* * *

OVER in Europe all of the nations are struggling mightily for the mastery of the air, and they all admit bashfully that they have it. Great Bri-

(*Continued on page* 384)

POPULAR AVIATION

Combined with Practical Mechanics, Including Aeronautics and Aviation Stories and Mechanics

A Magazine for the Promotion of Amateur Aviation and Private Flying

Volume XI | DECEMBER, 1932 | Number 6

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XUM

What I Think About

by GENERAL
WILLIAM MITCHELL

Formerly Commander, Air Forces,
A. E. F., and Director, Military
Aeronautics, U. S. Army

Showing one of the bombs dropped under the port quarter of the battleship "Alabama." This bomb tore a hole about 48 feet long in the bottom of the ship and she sank in 30 seconds.

GREED for power and bureaucratic dominion over our national system of defense have endangered the security of the United States.

False statements have been issued by both the Army and Navy departments with the deliberate intention of misleading the public as to the adequacy of the airplane in war. For purposes of their own, which are perfectly obvious, both the Army and the Navy resist the establishment of a separate air department.

And without question, these departments together with many officials at Washington, are retarding the development of our greatest and most effective weapon—the airplane. They promote, for their own purpose, the obsolete battleship and other archaic weapons that are destined to become extinct in future wars.

And I will prove, with my World War experience to back my opinion, that the airplane is capable of sinking any battleship or rendering ineffective any land defense that may be constructed.

Ever since I returned from Europe in 1919, I had been training my men in the use of air projectiles against all kinds of targets, moving and fixed, on water and on land.

My staff officers were the same men who had handled the operations at St. Mihiel and the Argonne. The pilots, who had absolute confidence in their leaders, could be relied upon to do anything and were the finest aviators the world has ever seen.

The Ordnance Department of the Army, under General Williams, made the greatest aerial weapons ever constructed. He really did it in face of the opposition, either open or covert, of the War Department.

The Navy began their publicity to show how aircraft could not possibly sink seacraft. They brought the naval transport "Henderson" to Washington, D. C., loaded it with Congressmen and as they proceeded down the Potomac River, naval officers gave lectures about how impossible it was for airplanes to sink battleships.

Instead of placing these vessels at a sensible distance from shore, which could have been done only eleven miles off Cape Hatteras where the sea is 100 fathoms deep, the Navy insisted on putting them about 75 miles off the Chesapeake Bay capes. This was done to handicap our aircraft as much as possible.

The airplanes we had were those constructed for use on the front in Europe, with a very short radius of action, and to make them fly this long distance over water was a useless hazard to the lives of our men. In spite of this, so excellent was our organization and so able the men, not an individual was lost.

We knew full well that we had to sink the ships entirely. Putting them out of commission would have done no good. The whole air force was imbued with the same spirit of "do or die" that they had in Europe.

The first vessel exposed for practice was a German submarine which was promptly sunk by Lt. Thomas, of the Navy by seaplanes. Naval officers had no idea that such a quick result was possible. The next target was a destroyer. I took a formation up and when we got ready to sink it, it only stayed above water for two or three minutes—rent asunder by 300-pound bombs.

Next was the German cruiser

A close-up view of the hull of the "Alabama" showing the patched hole in the bottom of the ship. This hole, 48 feet long and 28 feet wide, was made by a 2,000-pound bomb.

Airplane Bombers

"IT is impossible for airplane bombers to sink battleships," claims the U.S. Navy. Read Gen. Mitchell's reply.

Note the tremendous hole torn in the forward deck of the "Alabama" by two 300-pound bombs. It is doubtful whether any of the ship's personnel could survive such a terrific explosion.

"Frankfort", an armored vessel with a protected deck. This also succumbed to our attack in a few minutes. The navy was now beginning to be scared. They knew we had knowledge of the effect of bombs and that our men could hit their targets under any ordinary conditions.

THERE remained the battleship "Ostfriesland" to be bombed. This vessel was built by the Germans to be an "unsinkable" craft for use in the North Sea and at that time it was one of the strongest vessels afloat. She had survived the battle of Jutland where she had been hit by two mines and several projectiles of large calibre. Her watertight compartments were solid all the way up. She had three skins in her sides.

She was light, with no ammunition aboard and no steam in her boilers. If a battleship in operation is hit good and hard by a bomb, it will probably blow up her boilers and explode her magazines, thus making destruction easier than with an empty ship.

In a joint Army-Navy conference before the bombing, it was agreed in writing that I should make at least two direct hits on the Ostfriesland with our largest bombs. I knew full well that we could not sink the ship by hitting it on deck, no matter how much that would put it out of commission. We would have to hit under it, alongside, in order to accomplish our purpose.

We first dropped some smaller bombs on the vessel merely to take note of their effect. When the day came for us to use the big bombs, the Navy attempted to interfere but I told them we were coming out anyway. I didn't care if they stood by and looked, or not.

Proceeding to the target we dropped our 2,000 pound bombs. Within seven minutes, one of the strongest battleships known rested on the bottom of the ocean. *The bomb that sunk this ship was heard around the world.* Every nation, except our own, modified their national defense arrangements accordingly.

A few days after this, we were given the battleship "Alabama" which was anchored in shallow water in the Chesapeake off Tangier Island. I first tried the effect of gas on her. I found that even without a forced ventilation system that the gas curtain thrown over her by small bombs, exploded on deck or in the immediate vicinity, completely permeated the structure.

No matter how the crew might be protected by gas masks, if a sufficient quantity of gas could be put there, it would kill them all. We also showed how we could find the ship at night and make hits on it, which is practically as easy to do as in the daytime. Later we attacked this vessel with large bombs. The first bomb struck under her port quarter and tore a hole about 48 feet long and 28 feet wide in her bottom. She sank in thirty seconds. This bomb had detonated against the bottom and its great force was thrown upward and against her. This is what would happen to war vessels anchored in a harbor when attacked by aircraft.

The next bomb tore a hole about half as big on the other side. The next ones hit her decks, tore off her masts, bridges, conning towers and superstructure completely, leaving her an absolute wreck in a few minutes. I tried to get the Navy Department to send divers down to note the extent of the damage under water, but they

Looking down through the hole torn in the forward deck of the "Alabama." Note the distorted structural members and the various other evidences of the tremendous force of the bomb.

would not. Later the hulk was sold to a firm in Baltimore for junk.

THEY were told by the Navy Department that the ship had been sunk by hits on the deck. They bid on it accordingly, but when they got down there and examined it, they found these great holes in the bottom which cost them thousands of dollars to plug up. I inspected the ship when she was hauled out in Baltimore and took photographs of the great wounds inflicted on her by aerial bombs.

Two years after the first bombing exercises, in 1923, I again obtained two battleships by Act of Congress. These, the New Jersey and Virginia, were anchored about 11 miles off Cape Hatteras. Again, the War and Navy Departments tried to interfere. A few days before bombing was to take place, we got a positive order from the War Department that bombing would have to be done at 10,000 feet altitude.

There was no bomber in existence in any country that would lift a heavy load of bombs to that altitude. The order was merely sent in an attempt to discredit the Air Service. In war time we would attack shipping at any altitude we chose. Anti-aircraft guns are powerless to stop us. We prepare for the attacks by feints, gas screens and gunfire from the air when necessary.

However, we were not to be stopped by this order. I had some superchargers built previously, and a few airplanes had been equipped with them. They were quite dangerous as they frequently burst into flames. Lieut. Wade ferried these ships down from Long Island to Langley Field. Three days before the operations were to take place, Lieut. Austin, one of the greatest airmen who ever lived, took his squadron up 15,000 feet with its full load of bombs and with some new sights we had just obtained, made a splendid lot of hits. I said nothing about this.

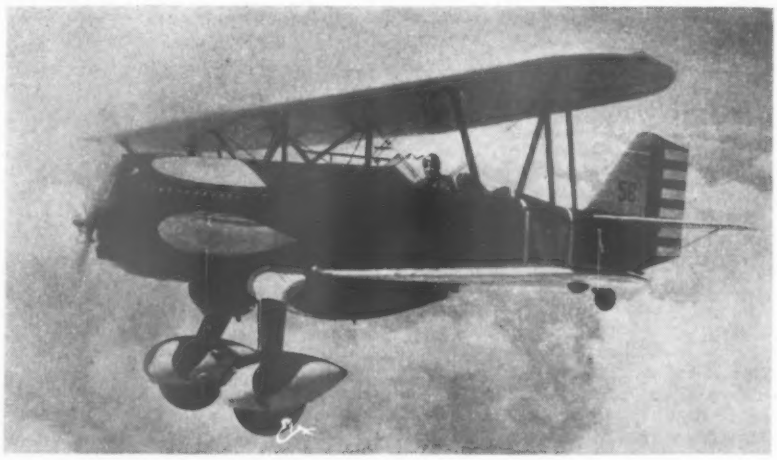
Two days later, the Army observers, Gen. Pershing among them, were waiting off Cape Hatteras to see the bombing. Flying 169 miles, through three thunderstorms, mist and fog, Austin's squadron appeared on the minute and attacked the New Jersey at 11,000 feet. About 70 per cent. of effective hits were made and the ship was left in a sinking condition, although it had not entirely disappeared.

For two years we had been allowed no target practice with our heavy bombs, not even with cement bombs, and our bomb-dropping equipment was in bad condition due to disuse. The result was that when we attacked the other battleship, the Virginia, the bomb traps stuck and our large bombs went two or three hundred feet wide of the mark. Even at that, the under-water portion of the ship was so badly damaged that she was out of commission.

Knowing this, I equipped the next squadron with two 1100-pound bombs each to be fired simultaneously. I

(*Continued on page 400*)

A Close-up View of the P6E in Flight



Showing the trim lines of the tiny P6E fighter, a recent addition U. S. Army Air Corps Pursuit Squadron.

HERE we see the tiny P6E fighter in full flight above the clouds. This biplane is the smallest of its type in active military service and has proved both fast and highly maneuverable.

This particular ship is a part of the 17th Pursuit Squadron of Selfridge Field and is being flown by Captain Ross Hoyt, commander of the squadron.

The new landing gear, of the self-supporting type, is a noticeable addition to a military plane, while the bulging outline of the auxiliary fuel tank below the fuselage is of interest. It would be interesting to know just what effect this "hump" has on the aerodynamic properties of the body and what advantage is had with the "spats".

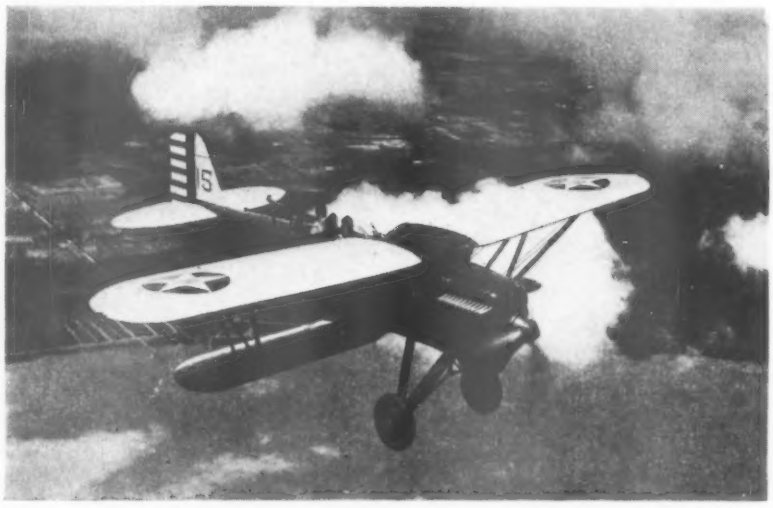
The Berliner-Joyce Two-place Pursuit Ship

A GREAT amount of interest is attached to the new Berliner-Joyce two-place pursuit ship, type P-16.

In the first place, it is a sesquiplane or modified biplane, the large top wing being of the "gull type" and attached to the fuselage by the gull wing bracket.

And, further, it is equipped with a water-cooled engine, a type to which the Army Air Corps adheres for this type of ship in preference to the radial air-cooled engine used so extensively in commercial and private ships.

As shown, it is being flown above the clouds by Captain A. B. Ballard, 49th Pursuit Squadron, Selfridge Field. Six of these planes have recently completed a record-making training and test flight from Selfridge Field to Rockwell Field, Calif., and return. No data is available on the performance.



Speedy and maneuverable is this Berliner-Joyce P-16 two-place sesquiplane.

What Takes Place In A Dog Fight

by CARL B. OGILVIE

A series of interviews with famous aces on the general subject of dog-fights.

DOG-FIGHT! Mad beasts snapping, snarling, biting, leaping; battling for a strangle hold; holding on until death—that is a dog-fight. In the air it's nearly the same.

Picture two or more planes, several miles above a shell-torn earth; machine guns instead of dogs snapping at one another; planes furiously diving, zooming, ripping and tearing at one another. In this struggle between men and planes all the savage instincts of beasts of the jungle are symbolized in mad and seemingly hectic lunges, leaps and swift acrobatics. It is a fight until death. A survival of the fittest. Dog-fight!

Frequently I am asked, by those who have not had the opportunity of witnessing hostile pilots engaged in actual combat, to describe an aerial combat or dog-fight. Also, what took place in some of the famous encounters during the World War.

Such questions are most difficult to answer. I have interviewed scores of aces and war-time airmen and their frank answer invariably has been similar to Lieutenant Stenseth's, an ace and personal friend of mine still in service in the Air Corps at Washington, D.C.

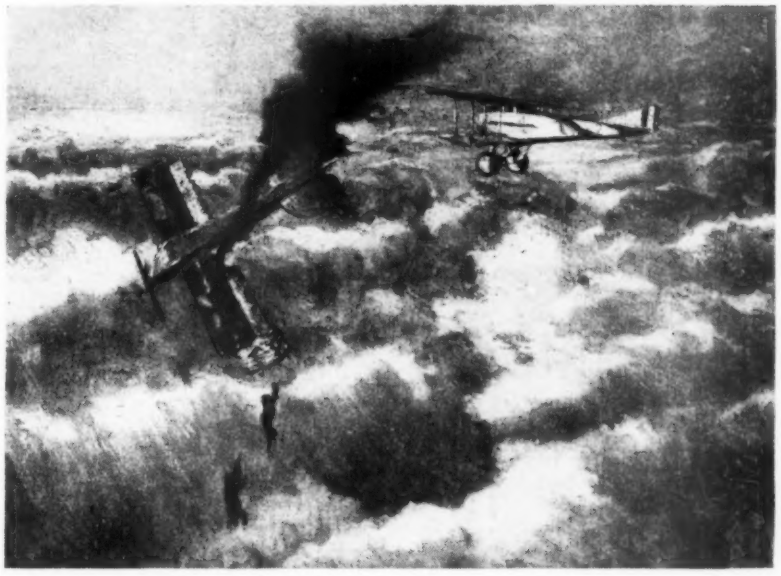
"It's almost impossible for a pilot mixed up in a hot dog-fight to give details with any degree of accuracy. So much is happening all at once. You dive in, let go a short burst or two. An enemy plane hops your tail and you either zoom or spin out of sure-death's path. Then you maneuver for another try at the enemy.

"Observers from near-by can better describe a dog-fight than anyone of the participants. When I came out of a scrap, all I seemed to be conscious of was that sometimes I had a ripped plane; usually a wheezing motor, and that I had been fighting to beat the old Harry. Even if I saw German planes go down I seldom was positive that I had shot them down."

MY STATEMENT is substantiated by one of our most remarkable aces, George A. Vaughn, Jr. He fought through to the end of hostilities and won his way to Acedome with 13 victories and the distinction of being our second living ace. He is now a staff officer of the New York National Guard with the rank of Lieutenant-Colonel.

In one of many personal chats he described to me the general picture of a dog-fight.

"Dog-fights were usually of short duration; frequently only a minute or two and rarely over five or ten minutes, although some were reported of longer duration. But that short span of time was a lifetime to many brave pilots.



The 45th victory of the famous French Ace, Guynemer, in which both the pilot and observer of his German opponent were thrown out of their plane by the violent spinning. From sketches by Lieut Farre, who witnessed this fight.

You pilot your plane in mad spinning circles. Motors roaring, struts and wires screaming under the stress of each new maneuver. The backwash of the prop seems an invisible demon trying to suck you out of your seat.

"Leading a squadron, I'd signal and we'd go down at a speed of 200 m.p.h. to pounce upon an enemy formation. Then it's every man for himself. It's impossible, for long, to single out any one enemy plane. With terrific speed and swiftness we are banking, slipping, zooming, rolling, ripping and tearing in one breath-taking, brain-bewildering series of aerial acrobats.

"The red belly of a German plane cuts the sky above your head and you know he has overshot on your tail. Back on the stick and up comes your nose. Your thumb presses, the machine gun trips and your Vickers rattle and tremble as they spew a stream of lead and tracer bullets through the propeller. A plane goes rumbling out of the vortex of gleaming props, yammering guns and screaming wires. No time to see who it is; hard to say who got him. There are so many firing all at once.

"You veer off. Another plane darts in ahead of you. This time you do not fire. It is one of your men diving for a Fokker's tail.

"You slip in. Your ship is seized with queer unfamiliar vibrations. A strut is chewed to bits. Fabric begins ripping off your wing. German Spandaus have a bead on you. You nose down to get out of an enemy's hail of lead.

"Up you come again and into the furious melee with open throttle. The moment a plane bearing the Maltese Cross crosses your gun sights the rattle and bang on the cowling is renewed at short intervals. The dog-fight rages on until one side or the other withdraws.

"There is no other type of fighting that requires so much of a man: steeled nerves, iron will and a clear head and eyes. A perfect coordination of eyes, muscles and brain, and the ability to react instinctively and do the right thing when an emergency presents itself. Of course it is taken for granted that you are good pilot and an accurate marksman. The best method, I found, was to get the advantage of a surprise attack before an enemy pilot could surprise me."

And for you chaps who like authoritative verification, I'll quote Canada's greatest ace, Lieutenant-Colonel W. A. Bishop, V. C., victor of 72 enemy planes, who writes:

"You fly round and round in cyclonic circles, here a flash of the Hun machines and then a flash of silver as my squadron commander would whizz by. All the time I would be in the same mix-up myself, every now and then, finding a red machine in front of me and getting in a round or two of quick shots.

"There was no need to hesitate about firing when the right color flitted by your nose. Firing one moment, you

would have to concentrate all your mind and muscle the next in doing a quick turn to avoid a collision. Then your gun jams and you have to zoom up and fuss with it to put it right."

From countless eye-witnesses of many aerial battles—American, British, French and Belgian, and after the war from many German airmen, I have collected unbelievably numerous folders of data of the World War's outstanding aerial duelists and their sky battles.

Conscious that I'm attempting a most difficult task I shall endeavor to give a clear picture and feeling of what takes place in the air during a combat of hostile air squadrons. Because I happen to be familiar with one of the most highly controversial dog-fights of the war, I shall use it as an example.

Immediately following that eventful hour on the morning of April 21, 1918—it was about eleven o'clock—when Captain Roy Brown, a Canadian and flight leader of 209 Squadron, R. A. F., rode to earth the bright red tail of a Fokker triplane, piloted by Germany's Ace of Aces, Baron Manfred von Richthofen, there waged a verbal war. The R. A. F. was thrown into a hot debate with the ground forces under the British command.

Two arms of the service claimed the distinction of bringing about the climatic end of the Bloody Baron! Roy Brown's guns had been driving lead into the "tripe's" fuselage and so had a machine gun of the Fifty-third Australian Machine Gunners. The argument was even heard behind the lines in Germany.

I shall attempt to trace, as nearly accurately as possible, the movement of Brown's squadron of 15 Camels and Richthofen's squadron of 10 Fokker triplanes, with Albatrosses and Staffel No. 5 hovering overhead, during the dog fight in which Richthofen lost his life.

* * *

ZERO hour. 10:00 A. M. Fifteen humped-back Sopwith "Camel" single-seater planes churned up the dust on the starting line in front of the hangars.

Major Butler in command of Squadron 209 R. A. F., at Bertangles, gave the signal. His plane darted forward, four more followed. The first flight of five planes was in the air. Captain Roy Brown, second in command, leader of "B" flight gave a signal. Soon his flight of five followed.

Brown led his flight to the right of Butler's flight flying in "V" formation. Flight "C" took up its place to the left. The big arrow headed wedge was made easily—perfectly. Squadron 209's fifteen-plane patrol was heading eastward into the land of the enemy where danger and death lurked at every rev of their propellers.

Coming out of the east, but unseen as yet, rode the mighty Baron von Richthofen, conqueror of 80 Allied planes, a challenge, menace and dire threat to every Allied pilot who dared to cross his path. In a bright little all-red Fokker triplane he was leading two flights of five planes each. Behind and higher came Staffel No. 5 of between ten to fifteen planes.

Fifteen British planes flying to meet unseen enemy formation of twenty-five speedy little death-dealing machines! Brown, rigidly trained, gazed aloft into the cold cloud-flecked sky. He cast a look over his shoulder. Experience had taught him that he must be constantly on the alert for surprise attacks if he was to protect his flying comrades.

Reaching the boundary line, the formation circled. Coming back over the lines, Brown discovered that his superior officer, Major Butler, and his flight had evaporated into thin air. These five Camels did not rejoin the other ten Camels that morning. Brown immediately waggled his wings and took command.

With Butler off in the sky somewhere, Brown felt keenly his increased re-

(*Continued on page* 396)

The advance of a German Staffel, lurking above the clouds for a surprise attack on an unwary Allied squadron.

Amelia Earhart's Reply to a Challenge

Amelia Earhart, premier woman flyer who has twice crossed the Atlantic by air, once as a passenger and finally as the pilot of a solo flight.

ON THAT sunny June morning when Amelia Earhart brought her speedy little monoplane down in William Gallegher's pasture near Londonderry, she was assured of an enviable and undisputed place in aviation history. But far more important to her was the fact that she had, at once and forever, answered the cynical criticism as to her ability as a flyer. To anyone else, the flight would have meant fame and fortune—to Amelia it was vindication!

After that first Atlantic flight when she was hailed as "Lady Lindy", headlined and editorialized, deluged with publicity and idolized by the public—none knew better than she, how little she had done to deserve it. She tried to say so—but the World loves a modest hero. Her efforts to turn the honor, or at least to share it with Stutz and Gordon, only added to her fame.

Nevertheless, she must have been keenly aware of that undercurrent of envy and malicious criticism, that such unwarranted acclaim had aroused in aviation circles. It was a challenge that could not be denied—there was only one solution—she must make a record that would *prove* her ability.

New trans-continental flights, altitude records, and speed dashes were constantly being made; even another ocean flight by a man would cause little comment. But it was the one record left that would mean a great deal to a woman pilot—and to Miss Earhart more than any other. It was the one chance to prove, beyond any doubt, her skill and courage. So with the same quiet dignity that has marked everything she has done, she made her preparations for it. Then without any fanfare or advanced publicity, she slipped out of the Teterboro airport one day and the next evening was out over the Atlantic.

Are Super-Planes Commercially Possible?

by GEORGE POMMER, JR.

IVAN SIKORSKY and William B. Stout, both authorities on large transport planes, debate the economic value of the projected super-planes.

THERE is no definite limit to the possible size of airplanes, technically speaking. But commercial considerations restrict passenger planes to certain general dimensions and weight, just as they do with steamships, locomotives and skyscrapers, or in fact, any commercial machine or structure.

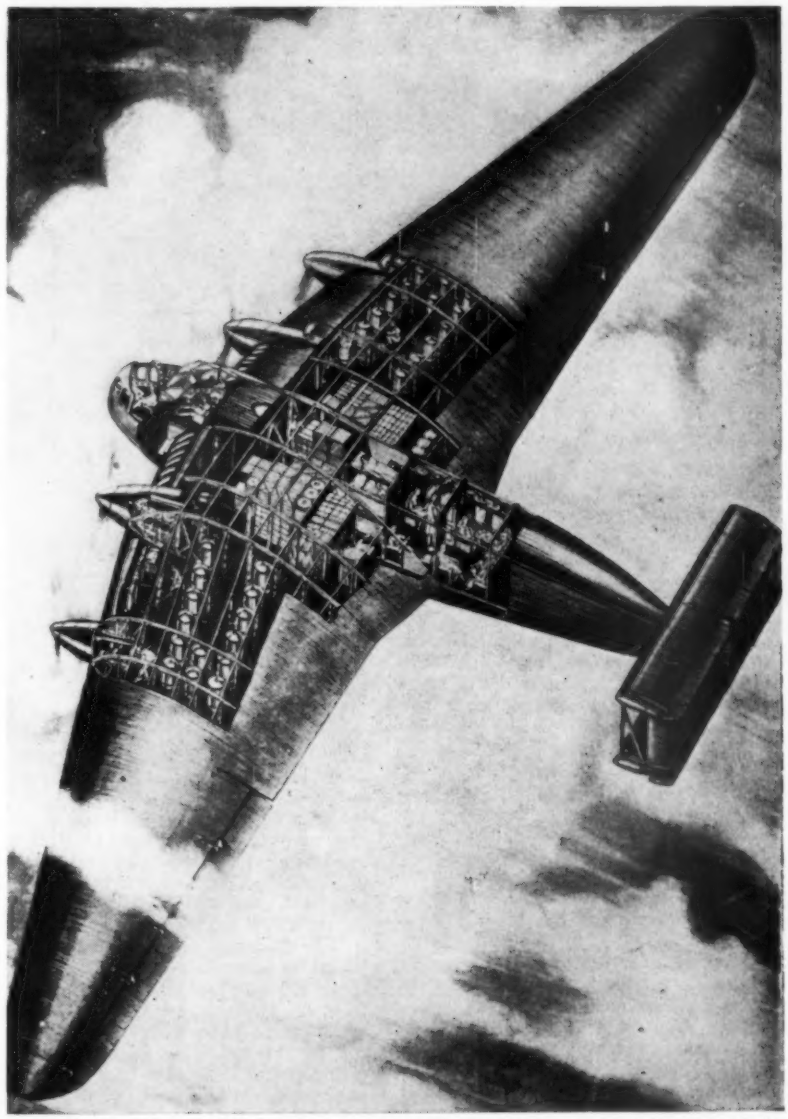
It might be practical from an engineering standpoint to build an airplane as big as an ocean liner. One that would carry five hundred passengers and a large crew. However, nobody would care to assume the terrific financial responsibilities connected with such a monstrosity. At least, not at the present stage of aeronautical development.

As Mr. Sikorsky pointed out: "For the time being, it is believed that five ships carrying forty passengers each would represent a more convenient and flexible equipment than one huge unit capable of carrying two hundred passengers."

Mr. Stout furnishes the explanation: "The limit to the size of airplanes is determined by the commercial figures of lowest cost per passenger mile. This limits the airplane to comparatively small sizes unless some company wants to run a charity air line."

When questioned, regarding the possibility of building even greater superplanes with the advent of lighter structural materials and lighter and more powerful motive units, Mr. Sikorsky replied: "I believe that two hundred passenger planes could be designed and built even at the present time with the existing engines. In the future, it may be a Diesel which will improve the economics of transportation, or it may be a conventional internal combustion engine using cheap, heavy fuel. It is possible that the latter solution will be even better than the Diesel because it will promise lighter power units."

No matter how radical various aeronautical developments may be, the airplane of the future that will be the most common and popular in commercial work will be the one that will yield the greatest dividends per dollar invested. At present, the comparatively small ships of eight to twelve passenger capacity are preferred, although eighteen to twenty passenger machines are fast gaining approval on lines where air travel is quite heavy.



A phantom view of the latest German Junkers-superplane "D-2000," designed for transatlantic passenger and freight transport. Note how the wing is utilized for carrying the cargo and fuel.

Among the various types of heavier-than-air craft, the landplane seems destined to become the universal favorite, especially on overland lines.

"Eventually all airlines will be operated with landplane types because of the extreme cost of upkeep of a water-tight hull and the slower speeds available for the horsepower," Mr. Stout remarked.

Of course, the three types, i. e., land plane, seaplane, amphibian, supply three distinctly different needs and cannot be compared to the disadvantage of one or another.

MR. SIKORSKY explains this phase of the subject very clearly: "In the case of very large ships, the seaplane appears to be the leader for obvious reasons, such as landing space and handling facilities. According to local conditions and various secondary considerations, seaplanes or landplanes may prove more successful and economical in a particular case, but in general they are comparable to each other.

"The amphibian will always remain somewhat more expensive because the structural cost of this ship must obviously be greater than the cost of the

two other types, and the payload carried must be somewhat smaller.

"From the standpoint of safety I believe that each of these ships, properly designed and operated, is already safe, provided a suitable type of ship is used, according to the geographical conditions of the route and of the landing terminal. For example, it appears that seaplanes or amphibians are definitely preferred over water routes."

According to Mr. Stout's point of view, the most economical sort of aircraft today is an eight passenger, 150 mile-an-hour plane, fitted with engines costing not more than $6,000. This type of ship can be successfully operated on a schedule of six to eight hours in the air each day, except during periods of complete overhaul, of course. But, where business is exceptionally heavy or where the hops are unusually long, it might prove more economical to use a larger unit.

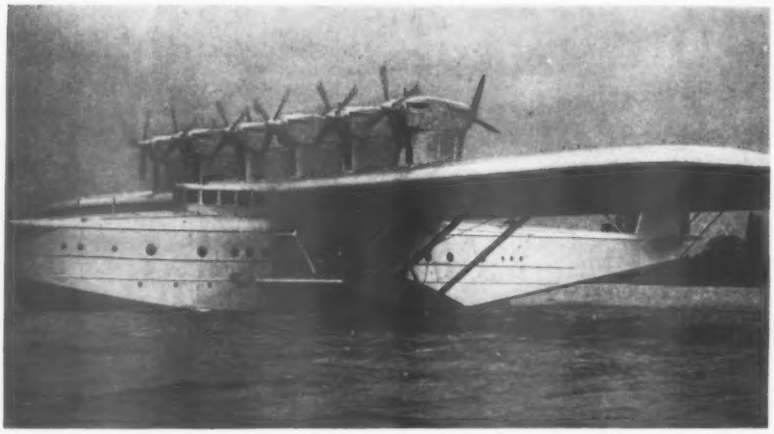
During every discussion on superplanes, there arises the natural question that every layman is inclined to ask: Is a giant thirty or forty passenger airliner as safe under all weather conditions as a three or four passenger craft?

William Stout answers in the negative. "Having more momentum and considerably less maneuverability," he declared, "it cannot be as safe as the smaller craft in the case of forced landings. The big liners, fitted with radio and complete navigation equipment, however, can be made less likely to have forced landings."

MOST of the leading airline operators have already placed two-way radios and the latest in approved navigation instruments on board all their ships, large or small, and the number of fatal accidents occurring on licensed transport lines has diminished to almost nothing, during the past year.

Even night flying has become a safe and sane undertaking for the tourist or the traveling business man. Well lighted routes and powerful beacons at the terminals and intermediate fields guide the airman safely to his destination through rain, snow, or fog.

As many already know, the largest heavier-than-air craft built in America are the Sikorsky amphibians of the S-40 type. In addition, they are the biggest combination land and water planes in existence at the time of this writing. Capable of carrying forty passengers and a quantity of mail and baggage, the S-40 weighs over 17 tons loaded!



The DO-X-2 recently constructed by the Dornier Company in Germany for commercial service in Italy.

Mr. Sikorsky says of his S-40 machines: "I am confident that the S-40 type is in every respect suitable for economical passenger transportation. Ships of this size are definitely superior to smaller ships from standpoint of comfort and they *attract* more passengers than a plane of regular size.

"I believe that very large airplanes, carrying one or two hundred people, may be properly and economically operated in the future. The right moment for their use will depend on the number of passengers available and the gradual study and development of operating, handling and maintenance problems. I believe, however, that this size is a few years ahead of us.

"For the time being, a plane carrying up to forty passengers, as the S-40, is to my mind entirely sufficient for several years to come. The comfort of an airplane necessitates full standing room, possibility to walk around freely, large and comfortable washroom facilities, a separate smoking room, etc. All this is, to a full extent, available in the S-40; therefore, a larger ship would add little to the comfort or pleasure of a trip."

That is the exact reason why it is extremely unlikely that the huge German flying boat, the DO-X, will ever become a commercial success. The original expense is exorbitant and it offers very little more safety or comfort than a plane only one-half as big. The value in the DO-X lies chiefly in its advertising ability and its military possibilities.

SEVERAL months ago, a sister ship slightly larger than the DO-X was constructed at the Dornier works, in Germany. It was christened the I-REDI, and was delivered to the Italian government for military work exclusively. The DO-X will in all probability be relegated to the German navy before long.

Another great plane in the possession of the Italian government is the gigantic Caproni 6000, a six-motored biplane, built in Italy about two years ago. It has a greater wing spread than the DO-X, and it could carry a tremendous load of passengers, but it was designed to be strictly a war machine. It is the mightiest bomber ever built! Along with the I-REDI, it gives Italy the license to boast the possession of the two greatest airplanes on earth.

English engineers aren't to be outdone by their neighbors. They now have a huge "safety ship", a six-motored flying boat that will be bigger than the DO-X. It is being designed for trans-Atlantic service and it will be the last word in luxury and comfort.

It is possible that mighty flying machines of that type will prove successful from a practical as well as an economical viewpoint in trans-oceanic work, but it is also possible that the English government will transform some of the giants of the sky into military machines that will do the work of dirigibles in war maneuvers.

It is plainly understood that the English have lost their taste for dirigibles.

(*Continued on page* 396)

The Caproni tandem triplane, an early but unsuccessful attempt at superplane design in Italy, made shortly after the World War.

Ormer Locklear–First Aerial Acrobat

by ELBERT HALING AND JAMES LOCKLEAR

An intimate biography of the first wing-walker and stunt man whose original demonstrations were the talk of his time

IT WAS the fall of 1917. The air above Barron Field, Texas, was exceedingly bumpy. An old army training "Jenny" was riding in rough jumpy circles above the field. The plane's instructor, a storm tossed flyer of the old school, laughed softly to himself as he imagined the uneasiness of the young student in the front cockpit.

Cadet Locklear was about to take the code test required of all flying Signal men. He calmly turned the handle of the windlass that allowed the ship's antenna to trail out below. A gust of wind suddenly swept the trailing wire alongside the ship and wound it securely about the tail skid.

The student looked at his watch. It was five minutes before the ground station would send him a call, a call that would remain unanswered unless the antenna was restored to its normal position. Motioning his intentions to his startled instructor, Locklear crawled from his seat and along the tail, untangled the wire and returned to his receivers just in time to hear the following message: "Cadet Locklear is ordered to appear before the Commanding Officer at once."

In an ensuing letter to his younger brother, James Locklear of Fort Worth, Ormer referred humorously to the reprimands he received for his radio repair work while in flight.

"The Major should have seen the Locklears jumping from the Santa Fe trestle with buggy tops," he wrote.

It was this restless spirit, however, in direct opposition to the Government's training policy, which held Locklear to a mere lieutenancy when his work really merited at least a major's commission.

Locklear had already achieved an enviable reputation in his home town as a dare-devil motorcycle racer until flying offered a more inviting outlet for his energies. Just before entering the ground school at Austin, Texas, he decided to give the local residents one last thrill to remember him by. Local papers made the startling announcement that Ormer was going to ride his motorcycle around the cornice of the newly built twenty-two story Bank Building.

"Thousands gathered to see if I'd fall," Ormer afterwards told his brother.

A wooden track had been built around the building's edge to facilitate turning the square corners. This was invisible from the streets below and the city fathers decided to stop the affair. They did. An officer of the Humane Society arrested the "entertainer" as he was stepping into the Bank's elevator.

One of the thrilling acts performed by the pioneer wing-walker, Ormer Locklear. Note the old "Jenny."

IT WAS in January, 1919, when military aviators were first allowed to give public demonstrations, that Locklear performed for the first time in history before a public audience, the feat of transferring from one airplane to another.

"I don't do these things because I want to run the risk of being killed," Lieutenant Locklear would say. "I do them to demonstrate what can be done. Somebody has to show the way. I want to do things people feel can't be done. I don't believe that anything is impossible but perpetual motion. I am convinced that some day we will all be flying and the more things that are now accomplished, the quicker we will get there."

Transferring from the top wing of one ship to the ship above him at night.

This unusual person actually believed that nothing was impossible except perpetual motion. The thousands who marvelled at his aerial exhibition at the Texas State Fair in Dallas in 1919 will never forget him. He was truly a pioneer in aerial navigation, successfully performing feats which even the renowned Glenn Curtiss had declared "impossible."

Although Lieutenant Locklear pioneered most of the aerial circus flying stunts and could duplicate any other stunt man's performance, he refused to make parachute jumps. Through all of his experience during the war, as instructor for men who later became aces, he never used a parachute. During his barn-storming days he continued this record. Glenn Curtiss made him a gift of a specially built chute. It still remains in its original packing.

A scout from the Fox Film Company of Los Angeles saw Locklear and his inseparable companion and pilot, Lieutenant Milton Elliott, startling Texas Fair patrons. He was also startled and wired his boss. Not long afterward Lieutenants Locklear and Elliott were en-route to Los Angeles to sign a movie contract with Fox. Ormer left behind in Fort Worth his bride of but a short time, the former Miss Ruby Graves.

"Ruby will keep the home fires burning until I return," the illustrious flyer told reporters laughingly. He later

kept his promise but in a way that he must have never imagined.

"In keeping with doing the impossible, I'm becoming an actor," Ormer wrote his brother. This was in August, 1920, just before his greatest picture, "The Skywayman," began production. In the picture he was required to fly into a church steeple, change planes in mid-air, jump from a plane to a speeding train and crash into an auto.

MOVIE patrons today are almost bored after witnessing so many air epics on the silver screen. Imagine, however, the difficulties encountered by a pioneer stunt man. Aviation experts flatly denied that Locklear would survive any of the stunts required of him in this picture. Even the movie magnates became dubious. With those who controlled the purse strings forming an audience, Locklear and Elliott put on a special show. They did everything known to the aviation world and did it at night, the first time in history that illuminated night flying was entirely successful.

With a phosphorescent plane and flying helmet, Locklear stood on his head on the top wing at 1,000 feet. His audience was more than convinced and many confessed they were unable to sleep that night due to extreme nervousness.

Although he had no previous acting experience Locklear became a star over night. Mary Pickford, Tom Mix, Charlie Chaplin, and Lew Cody were among his closest friends about the studios.

The first epic of the air was approaching its climax. In the final scene Locklear climbed to 8,000 feet, lighting the torches on his plane to give it the semblance of a burning plane. Elliott was also in the plane and the two were supposed to be falling to their deaths. This was exactly what happened!

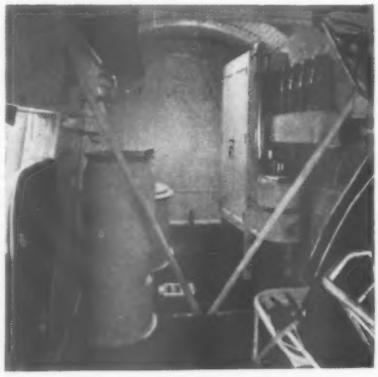
Witnesses of the death flight declared that the plane took off on scheduled time and described loop after loop in the blackness of the night, with fireworks charting the course in lines of fire. Searchlights played on the plane and cameramen on the ground below constantly shifted their cameras in order to register the full action.

From 8,000 feet, Locklear volplaned to 2,000 feet and then went into a nose spin. Within 200 feet of the ground the plane righted itself, then went into a dive in a mass of flames while the cameramen continued their task as the plane hurtled to the earth. Both aviators were dead when help came. The exact cause of the disaster is still a matter of conjecture.

Lieutenant Locklear lies buried today in the quietness of Greenwood cemetery, Fort Worth. His grave is a constant shrine of worship for those who appreciate what the aviation pioneer of yesterday has done for the aviation of today.

END

Interior of Hospital Plane



The operating room is compact and well arranged.

THIS is the interior of a Fokker ambulance plane used by the U. S. Army Air Corps. It provides accommodations for two patients, one surgeon and one attendant in addition to the pilot who sits in the open cockpit on the outside.

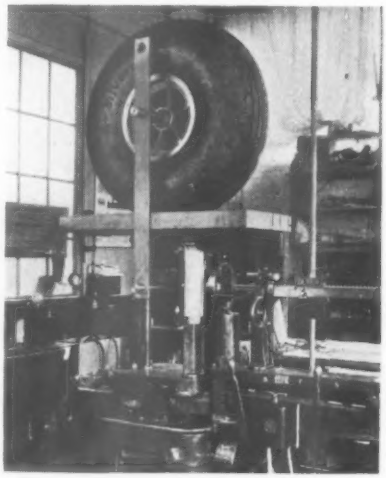
This plane is fully equipped with the necessary surgical appliances for giving first-aid at an accident or for performing minor operations. It is particularly valuable because of its speed, for it can reach the scene of the accident in a very short time.

Testing Transport Wheels

IT IS important to know how much load the wheels of a transport plane will withstand, for in addition to the weight of the plane and passengers, there are the various impact landing loads, side swipes and others.

To determine the strength of these wheels, the Boeing Airplane Company places the wheels on a testing machine and thus applies a measured false load, taking the amount of deflection or the "give" of the wheel at the same time.

On testing the wheel shown here, the deflection was shown to be 9.75 inches under a load of 20,000 pounds.



The transport wheel mounted on top of the Olsen Compression tester.

Attacked by an Eagle

(See front cover)

THE American bald eagle is a large, fierce, predatory bird of great courage that rules the air in its mountainous dominions. It will not hesitate to attack an intruder within those dominions no matter how large nor strong that intruder may be.

Recently, there have been many stories sent to us, telling of attacks by eagles upon planes flying in the Rocky Mountain districts, attacks that at times were so fierce and prolonged that they endangered the safety of the aircraft and thoroughly alarmed the pilots.

Such attacks are a direct menace to the ship for several reasons, not only because of direct danger to the pilot himself from the talons and beak of the bird, but for the reason that these birds might get wedged in the structure of the plane or fly into the revolving propeller, causing serious damage.

Our cover artist, Herman Bollin, has pictured an incident that was described to us recently. The pilot was ferrying a new ship to a Colorado airport through the mountain pass shown, when he was confronted by an infuriated eagle diving down on him. In this case, the eagle made the attack directly upon the pilot and not on the ship as is usually the case.

Very fortunately, the pilot was provided with an automatic by which he finally disposed of the bird after a fierce struggle. His constant fear was that the bird would dart into the propeller and thus bring them both down into the rocky canyon below, but fortunately nothing of this sort happened and the pilot came off victorious.

Gulls, while only curious and not vicious, are also a menace to the safety of planes.

Photo Phanatics Club

WE HAVE a lot to tell you fellows. Maybe you will like the idea and maybe you will not, but anyway it is designed to meet the best interests of all concerned.

And it is this. We are going to combine the Photo Phanatics Club and the Barter and Exchange Department, for the reason that the Club is simply an exchange system after all, and it would be easier for you and easier for us if your swaps were all put together under one head.

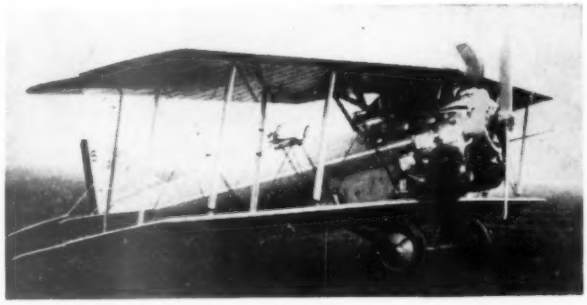
Now this is not at all for the reason that there is any lack of interest in the Club—far from it—for we have had more letters this month from the Phans than ever before. It is simply a matter of saving space in the magazine, and making it better for the various kinds and degrees of swappers.

And so, this month and the months to come, look for your photo trades and deals in the Barter and Exchange Department that is to be a regular feature of P.A. If you don't like this idea, write in and tell us so.

A Squadron of Spad Warplanes

for Your Collection

Among the most interesting of the allied warplanes are the "Spads," built in France by the Societe Pour Aviation et Derivee. The name of the ship is taken from the initials of the manufacturing company



Buggatti-Spad with cannon firing through propeller.

Spad with 220 h.p. Hispano engine, but with one fixed machine gun.

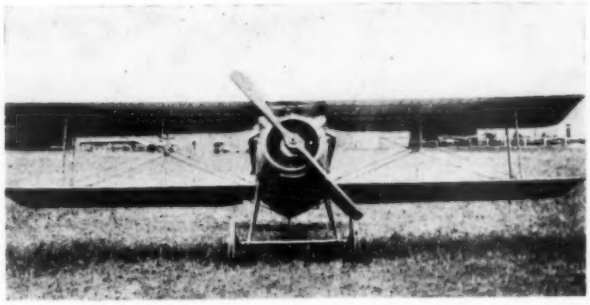
Spad belonging to La Fayette Escadrille.

Observation Spad with 236 h.p. Hispano engine.

Spad Type 13, one of the best known Spads.

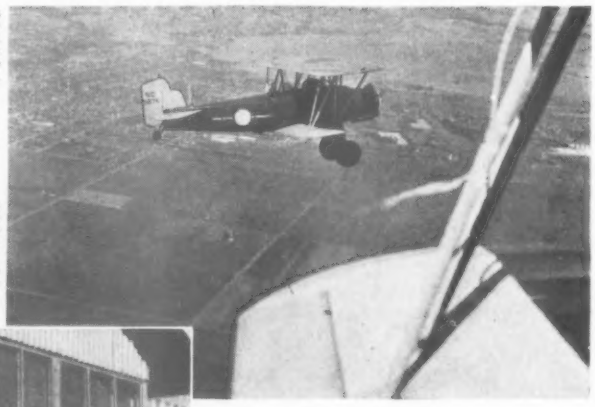
Spad Type 22.

Spad "cannon" plane with two fixed machine guns and one 37 m.m. cannon firing through prop hub.



Spad equipped with 220 h.p. Hispano engine.

The Use of Radio



At the right we see a student making a solo flight, yet he is kept in constant contact with his instructor through his radio receiver.

Below. Watching his every move from the ground, the instructor can correct or assist the student at any time, a fact that gives added confidence to the student.

by GEORGE MEYERS

Chief instructor, Boeing School of Aeronautics

NOTHING in the development of flight training seems to offer greater promise than use of radio to correct and prevent mistakes at the moment they have occurred or are likely to occur.

Not long ago, soon after we had installed receiving sets in our training planes, I sent up a student with instructions to follow a particular routine, in order to correct a fault he had developed during the preceeding few days.

He had failed to follow instructions in developing his own skill and experience and, apparently thinking he knew his own abilities, proceeded to spin the plane in what he thought to be an orthodox manner.

I permitted him to complete the first evolution. Then I stepped over to the wire fence separating the flight house from the flying field, pressed a button and commenced to speak into the telephone:

"You are trying to enter the spin before you have stalled the plane," I said. "Hold your plane level a little longer. As you give it rudder, cross your stick to the opposite side. Now climb on up there and try it again."

The answer came immediately—and it was permanent!

Psychologically, (a word few of us older pilots understand) the little lecture proved of untold benefit. Elsewhere, in correcting sins of commission and omission by students in the early stages of solo, I have noticed that when the radio voice of the instructor, talking through the air to a student four thousand feet directly above the field, flows into the student's ears, he seems to take added confidence. He completes his maneuvers as accurately as though an instructor were riding in the other cockpit.

We use radio for three purposes. First, of course, to correct faults on the spot and not after the student lands —possibly an hour later. Second, to send instructions to students flying possibly 20 miles from the school or to recall them in case of poor visibility. Third, to give them experience in following radio beacons on cross-country flights, a subject ably discussed in Mr. Le Farge's article in the September POPULAR AVIATION.

Of the three, perhaps in the final analysis, the last named is our most important phase of radio flight training, yet that, too, follows the first two phases only after the student becomes conscious of the reliability and rapidly increasing importance of radio. Radio is not only of importance to transport pilots, but to all who would pilot airplanes along government airways.

POSSIBLY, some of our experiences and conclusions will be of interest. Since the major airlines now will employ only pilots who, through experience or training have become expert in the use of radio, its use in a school not only offers instructors an opportunity to control the student through instruction by voice at a time when it is most needed and when correction is essential and to send essential information during early stages of training, but it also prepares him for the time when he must rely on radio when flying his own or some large transport plane during hazardous weather conditions.

Radio training for pilots on the scheduled airways has become absolutely essential during the last few months. At present, the Department of Commerce is rating all pilots on scheduled airlines in accordance with their ability to utilize all the known methods and aids made available to them by the government. Of these aids, radio is of far greater importance than any other.

The vast army of young men who may be planning their futures in some part of aviation will learn that the more training they take and the more experience they acquire with this particular facility, the better able will they be to cope with the various problems that will and do arise.

With us, these problems commence with assembly of the radio receiver before installation (by the students) in the ships they are to fly. Responsibility commences and ends with the student.

Having installed his receiver, he tests it and when, in his opinion it is ready for operation, into the air he goes—ready to follow his instructor's suggestions.

Radio is particularly helpful during the first few hours of solo. Some of the old timers may say that all a student needs is a little confidence. Granted. But what can be of more help than a voice saying, "All right, old boy. Take it easy. You're not alone. I'm down here watching and I'll tell you what to do if you're in trouble."

It stiffens a wavering backbone and restores in seconds a confidence some youths might require days to regain.

In this, of course, we use only one-way radio. Installation, recently, of the standard United Air Lines two-way radio telephone equipment in the school's Boeing 40-C permits a further step in the training of a student pilot. This airplane is equipped also with a

in Training Pilots

RADIO takes the sting out of that first solo and immeasurebly increases the safety in flight instruction. In this article, by a well known flying instructor, we learn how remote instruction is carried out.

hooded cockpit for instrument flying and in addition to normal instrument training it is used extensively for the longer cross-country flights.

THESE flights are confined to the immediate vicinity of United Air Lines operations and so the student can make regular position reports to United Air Line operators as required while on extended flights. Here the student is fully instructed in the form and method of making these reports and is expected to listen in for calls from the ground stations which may apply to him.

From the remote microphone in the school flight office, I speak directly to the student at some time during such a flight, reminding him he is for all practical considerations, a transport pilot, flying on schedule with a load of passengers. It isn't long before he visualizes himself in just such a position and he turns himself to his tasks more conscientiously than would the ordinary student flying cross-country without radio contact.

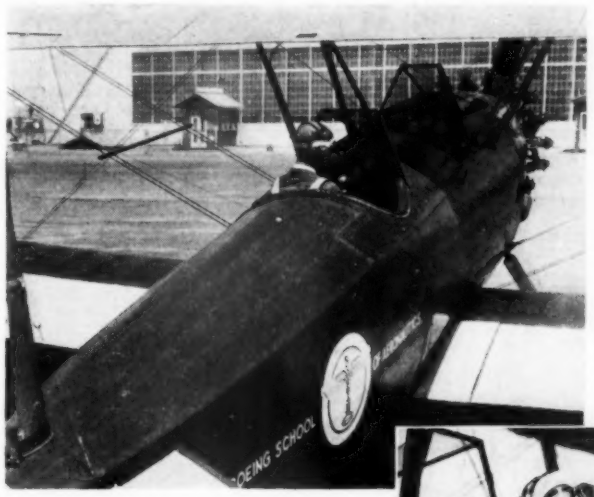
The technique of radio instruction is simple. I need not theorize on it. But why have we added this department to an already crowded curriculum?

Practical reasons motivated us in bringing radio into school instruction. There have been cases where a pilot's familiarity with some of the peculiarities of his radio equipment has allowed him to determine his position very much closer and aided him under bad weather conditions when without radio he would have been lost. I could multiply cases, but you have heard of some yourself.

Just one. A pilot on one of the major airlines, while ferrying a plane, was caught in a blizzard and encountered severe icing conditions, making it impossible for him to climb over surrounding hills.

His knowledge of the directional properties of the antenna system on his airplane allowed him to determine with considerable exactitude, the direction of the transmitting ground stations. In spite of the extensive maneuvering he was able to ultimately find his way out. The Navy have frequently used the directional qualities of their antenna on broadcast stations to locate position.

Use of these same directional qualities of certain antenna systems simplify other problems of flying, notably following the radio beacon beam.



At the left is a radio equipped Boeing trainer ready for a student flight. This equipment keeps the student in touch with the instructor at all times, so that if the student makes an error, the error can be corrected instantly.

Below is a student wearing his radio headset for listening-in, while in his hand is the microphone used for two-way communication between the student and instructor.

SUCH incidents as that cited, brought home to us the necessity for the broadest possible experience in radio so we decided to equip our student training airplanes with radio equipment as rapidly as it became feasible to do so.

A Boeing 203 trainer, which was undergoing modification at the time, was equipped with a standard airways receiver fitted with remote control in order to try out potentialities of radio in student training. As this same airplane is used with the hooded cockpit for instruction in instrument flying, modifications were made to the radio set to allow inter-cockpit communication through the same earphones as would be used for the radio.

At the same time, a remote microphone was installed in the Flight Office, which was connected with a 10A transmitter in the United Air Lines' station on the Oakland Airport. This microphone gave the flight instructors on the ground communication facilities to this airplane in the air.

No attempt was made to fit this airplane with the transmitter for the standard transmitter used on the airlines is somewhat cumbersome and heavy for training planes which will necessitate further experimental and development work to fit the particular needs of the flying school.

The potentialities opened up by this equipment were sufficiently great to arrive at a decision and proceed with the equipment of the other planes with similar equipment as rapidly as possible. The second plane, a four passenger cabin job, has also been equipped and the third plane, a Boeing 40-C, has been equipped with standard two-way communication, for this airplane is similar to many of those operating on United Air Lines and can use exactly similar equipment to that on the airlines. The other airplanes of the school fleet are now being similarly equipped.

Experimental work is being done on the development of very light transmitting equipment by a local concern in an attempt to supply the obvious deficiency for the lighter type of airplane. It is still too early to render conclusions as to the potentialities in this field. However, some success has been achieved by radio experimental organizations in other parts of the country using wave lengths as short as five to seven meters.

A recent experiment at the Oakland Airport by this concern allowed two-way telephone communication on seven and one-half meters wave length over

a distance of thirty miles with an emission of 1/5 watt, the entire radio equipment, exclusive of dry batteries, being about the size of a cigar box.

One obvious limitation to the use of two-way radio communication in school training lies in the necessity for all operators of transmitting radio equipment, either portable or stationary, to qualify for the proper licensing under the Federal Radio Commission requirements. As two-way communications in school planes develop, it is going to be necessary for a student pilot to have a radio telephone operator's license before he can solo.

The new amendments to the radio law in the last Congress make it imperative for the holder of a radio operator's license under the Federal Radio Commission to be a citizen of the United States. This will be a handicap in the training of foreign students as it will be impossible to give them experience in two-way communications, particularly while in solo flight.

But the cold demands of business will cause this type of training to spread. The Post Office Department rate allowances to airmail carriers take into account in their rates the radio equipment of the airlines and pay a differential for two-way radio communication facilities. This differential is sufficiently high to justify the installation of this equipment by any airmail carrier aside from the operating advantages which the carrier will also gain.

The second assistant postmaster general, in a recent paper before the Buffalo Aeronautical Meeting of the American Society of Mechanical Engineers, estimated that the gross expenses of all the airmail carriers of the United States for the year 1932 will total $24,000,000. Mr. C. N. Monteith, Chief Engineer of the Boeing Airplane Company, in a paper read before the Pacific Coast Aeronautical Meeting of the American Society of Mechanical Engineers, stated that seven per cent of the gross expenses of airline operations was chargeable to communications. This would indicate that nearly $1,700,000 is being spent by the airlines in the operation of their communication systems.

From the mere statement of cost, the importance of radio as a universal tool in the operation of aircraft becomes apparent. "I know what it means now," said one of our students after a few words from an instructor —via the air—had warned him of a serious fault.

In his statement lies the chief importance of the entire radio training program. Unlike dual flying, here the student must make his own corrections, apply the instructions without a second pilot in the plane to correct them if he makes a mistake. He remembers because the correction is instantaneous *at the time* when he commits a blunder.

END

The Boeing F4B-4 Navy Ships Delivered

Showing the snappy lines of the U. S. Navy's latest fighter, the Boeing F4B-4.

THE Boeing F4B-4, fifty-four of which have been delivered to the U. S. Navy, is an improvement over its predecessor, the F4B-3.

It is said that the new member of the F4B family is exceptionally compact, maneuverable and fast, but no figures are now available on its performance.

This ship comes under the classification of a "carrier fighter" and is particularly designed for deck landing. This service, requiring compactness above all other structural features, of course results in a biplane type.

A Few Remarks on Amateur Flying

by LESLIE LONG

AS we come to the end of another year we find amateur flying and plane building going farther and farther down on its way to extinction. It isn't the depression, and it isn't lack of interest. It is the high hand of authority that is choking the life out of a young and promising industry.

No one who has watched the course of events during the past five years can deny this fact. We have before us the amazing spectacle of a budding science actually legislating itself out of existence.

Aviation in Big Business can take care of itself. It is subsidized and pampered and given everything it asks for. Well and good, let it be so. But why must they who have all this be so intent on destroying the very foundations from which they sprung?

Every airplane on earth is the direct result of the hope and labor and sacrifice of a type of man who is now being crowded out of the way. If Curtiss or Wright or Cessna or Farman or Roe or Dumont were to try to do now what he did a few short years ago he would be promptly slapped into jail and fined as a criminal. That's gratitude for you.

The love for original thought and labor will always live in every human who is worth his salt. Especially is this true in regard to scientific achievement. Can anyone blame the thousands of earnest Americans who strive to build a better and safer airplane than has thus far been built? Maybe not, but just try it!

Who made the Department of Commerce and Big Aviation their brother's keeper? By what right do they deny a free citizen the right to risk his own money and labor and life as he sees fit? If his enterprise is moral and honest and of no harm to others it is nobody's business but his own.

As has been repeatedly stated, the demand of the Department of Commerce, and of the separate states, for a stress analysis is simply prohibition. An analysis that is satisfactory to the Department costs from several hundred to several thousand dollars and is entirely beyond reach of the experimenter. Further than that if an experimenter did get a Federal license it would defeat his very purpose. Once obtained his ship is done, wrapped up in the coils of red tape and subject to the whim of authority. He couldn't change an aileron without losing his license and probably his liberty.

A couple of years ago there were a good many thousands of young men building and learning to fly light airplanes. The flying schools were busy and the supply houses were prosperous. Today these young men are building motor boats and racing cars and the schools and supply houses have closed their doors. The LAW did this. Make no mistake about that.

And this same Law that is so solici-

(*Continued on page* 388)

A Busy Day with a Mail Hopper

by KATHERINE NUNN

From daybreak until past noon, we follow in detail, the routine day's work of a mail pilot on a Big League airline

IT IS seven a. m. The large clock in the radio station and ticket-office, Love Field, Dallas, Texas, says so. Three men look up as a plump, short little fellow of about forty, with sandy hair, blue eyes and a matter-of-fact manner comes into the pilot's office and picks up his log-book.

It is Herbert L. Kindred who learned to fly during the World War and who flew the first newspaper route in the United States—the first air mail out of Texas in 1926 to Chicago. And, after flying 10,500 official hours this man has the record of never damaging a ship nor injuring a passenger.

Outside, the huge tri-motored plane has been idling for several minutes. Air Mail Pilot Kindred adjusts the radio transmitter which hangs around his neck and swathed in his flying togs, waves jauntily to the men, goes through the swinging doors and climbs into the cockpit of No. 33—a monoplane that can carry 600 pounds of mail to its destination.

Fifteen minutes ago the mail sacks were placed aboard the ship and the plane was inspected from head to tail by expert mechanics. Pilot Kindred is to fly it to Atlanta, Georgia, 780 miles away, in six hours and forty minutes. He is leaving right on the dot. If everything goes well, at 1:40 p. m. he will be stepping out of the ship at the Atlanta airport.

In the uncertainty of an early dawn, the engine roars and spits blue flames, its propeller flails the air and it quivers a moment, as he notes all of the instruments, and pulls down his wind-tight goggles. The ceiling is too high to worry about, but fog obscures the towers of Dallas. However, he is not greatly concerned about the poor visibility, for he has learned to take that casually. As he shoves the throttle forward, the tachometer runs up from 600 to 800, 1200, 1800, 2200 revolutions per minute. The plane strains at the chocks. Back comes the throttle, and the roar dies away. A wave of his hand and the chocks are pulled out.

Most of Dallas is still sleeping. As the ship rolls out into position, Pilot Kindred gives a final look around to see that no ship is coming in for a landing. Everything being clear, the motor roars again. Huge sparks come bursting from the exhaust. Faster and faster the plane rolls until within a few seconds it has left the ground and is disappearing into the dawn.

THE mail is not so heavy today, so Kindred pulls the stick back and

Herbert L. Kindred, the hero of this tale, who is an old-timer with 10,500 air hours to his credit.

climbs in a hurry. Up, up into the wind. 600 feet a minute is the rate of climb which the indicator shows and the ship is not only climbing steadily but it is going rapidly forward as well. At 3,000 feet he levels off. Beneath him stretches a stirring country-side. The air gets a bit bumpy and the ceiling lowers.

The day is clear as a crystal, but the wind is rising. Behind him far into the hazy distant morning he has left an awakening Dallas.

Exactly fourteen minutes after taking off, not a second later, he hears in his ear phones: "Radio Station, Love Field, calling Kindred in No. 33. Go ahead, Herb."

He presses a button in the top of his joy stick, and speaks into the microphone hung about his neck: "Kindred in No. 33, reporting position forty miles southeast of Dallas, altitude 3,200 feet. O.K."

"Got you, Kindred. O.K."

And the voice which had seemed to come from the silence had as suddenly died away. Once more Kindred is alone in his plane with only the clouds and the rising wind to keep him company. It is not so very long before he sees the smoking activity of the East Texas oil fields and then the bright line of the Red River beneath him. In a few minutes he is coming into the airport at Shreveport. He comes in rapidly and rolls up close to the hangar. Piles of mail await his coming, from Los Angeles, El Paso, Abilene, Mexico City, San Antonio, Houston and New Orleans. Kindred does not get out of the ship and the propeller keeps spinning slowly.

Presently the mail is all in its snug compartment and an attendant comes running with a message from the Government weather broadcasting station. It is in regular radiogram form with strips of teletype paper pasted on and the message is unintelligible to all save mail pilots. To Kindred there is a world of meaning in it.

With a wave of his hand, Kindred taxies around the field and then flies straight into the wind. He will be off the ground at eight-fifteen. The message had given him valuable information. A northwesterly wind was blowing on the ground at eighteen miles per hour; up to 4,000 feet at twenty-eight miles per hour—above that, the wind shifted and decreased to sixteen miles per hour.

With the barometric pressure dropping at Monroe, Louisiana, it probably meant that the ceiling was lowering—he could not lose any time getting to Monroe. The heavy storm north of Jackson, Mississippi, he would find more about when he reached that approach to his destination.

He circled the field at Shreveport twice—for two reasons. First he must get above 4,000 feet to make time; second, he must get on that north radio wave from the government station. Soon he started climbing.

IT TAKES about eight minutes to get the desired altitude and another minute to get on that wave. Staying there, even with a light wind is not such a trick for it is only fifty yards wide at the airport. He looks down and in front of him, the wind is whirling sand up and up and up. The city is almost obscured by the dust.

Now he is set. In his ear the "dah-dah-dah" of the radio wave assures him that he is on his course—and if that fails, he knows he has his instruments.

At 8:23 a. m. he reports his position and altitude to Dallas and again at 8:48 a. m. He hasn't touched the controls, but suddenly the turn-indicator shows a turn to the right and his compass begins to oscillate violently. The ball in the bank indicator has dropped over to one end. Kindred touches the throttle lightly and kicks left rudder to counteract the sudden blast of wind from the west. The steady "dah-dah-dah" has ceased. Now it is: "dit-dah, dit-dah, dit-dah." He has been blown off the wave to the northeast, but in two minutes he is back again and once more the monotonous "dah-dah-dah-

dah-dah," broken only at intervals by the "dit-dah, dit-dah, dit-dah." He can hear two beats now. He notes that it has clouded over and the visibility is getting poorer.

At 9:00 a. m. he calls Birmingham, Alabama, to report his position:

"Kindred in No. 33, twenty miles west of Jackson—altitude 4,500 feet. Rain is beginning to fall. What's the weather doing in Birmingham? Visibility is getting worse here. Ceiling is high."

"Ceiling 1,800 at 8:30. It is falling appreciably. Wait a minute. Mist is falling? No, it has turned into blinding rain. It may not last long, however, and if you crowd that motor you can make it in good shape. As there have been rapid changes within the last twenty-four hours there is probability of clearing skies and good visibility. Good luck." Then again:

"Wind under ceiling is eighteen miles northwesterly."

As Kindred felt sure he was near Jackson, he began looking for the landing field. The rain was still coming down in sheets. He was unable to locate the field. He circled until he heard the radio from the field communicating with another party. He circled through the torrent of rain once more. Then the steady identification letter of the station was his reward.

"Kindred in No. 33, going to Atlanta, unable to land because of the heavy rain. Please instruct."

Several seconds later came the welcome:

"Tell your exact position, Kindred."

"One mile west of Jackson as near as I can estimate."

"Right. Come ahead. Circle while I give you exact instructions."

"O.K. Kindred."

ONLY airmail pilots can know the thrill Kindred had when he made the landing. It is now 11 a. m. and the rain had abated somewhat. While sacks of mail are being exchanged Kindred gets out for the first time to stretch his legs. It is still raining and Kindred talks to Birmingham, Alabama. It is raining there, with the wind rising. Things could be worse, but not much worse. It is up to Kindred whether he'll stay in Jackson or go on. He decides to go on and climbs back into the ship.

He is now flying into the Birmingham, Alabama, wave. The "dah-dah-dah-dah-dah-dah" comes every forty-five seconds. It is welcome relief from the noise of the pouring rain.

His air-speed meter is indicating 115 miles per hour and Kindred decides that he has a ground speed of a little more than 100 m.p.h. The tachometer indicates 1,800 r.p.m. and he crowds on more throttle. He must come down 3,000 feet to get under the ceiling while he still has time, and he eases the stick forward to lose altitude. He levels off at 1,500 feet. His air speed picks up to 125 miles. At that speed

(*Continued on page* 389)

Polish "RWD" Wins International Contest

The Polish monoplane, the "RWD", shown in flight. This ship, the winner in European events, crashed on its way back to Poland.

THIS "RWD", a Polish plane piloted by Lieut. Zwirko, won the first prize in the International Air Races, held at Berlin, Germany.

The monoplane is quite interesting from a number of standpoints, but probably the most noticeable feature is its adherence to typical American cabin design—a high wing cabin with an air-cooled radial engine.

It would seem that the same advertising stunts hold in European contests as in America, for within the two small circles on the fuselage we find the words "Stanavo", a gasoline, and "Castrol", the name of a lubricating oil.

Monoxide Gas Proves a Menace in Aviation

By L. J. LESH

DEATHS reported daily in the newspapers, warn the public of the dangers of monoxide gas from the exhaust of automobile engines when operated in a closed room. The number of accidents from the same source in both open and closed cockpit airplanes will never be known since the cause of the trouble is usually undetermined after the crash.

Some narrow escapes by pilots will be remembered, such as the trouble experienced by Al. Williams in his Mercury racer intended for the Schneider Cup Race. Williams had presence of mind enough to realize what was happening and came out alive. So did "Speed" Holman who actually finished winner in the Thompson Trophy Race at Chicago in 1930 although almost overcome by fumes.

Captain Page of the Marines was killed in the same race, probably by gas. Laird and other designers have carefully studied the problem and since that time fresh air pipes are usually provided in present day racers to assure the proper ventilation of the cockpit.

A near tragedy to the passengers on a trimotor flying between Chicago and Kansas City on October 12th has again brought this danger before the public eye. Transport ships equipped with air-cooled motors are generally provided with cabin heaters which take warm and supposedly fresh air from jackets surrounding the exhaust pipes.

Obviously a leak in the exhaust pipe means that the passengers are endangered and it is a peculiar property of monoxide gas that it is difficult to detect and usually takes effect before the victim is conscious of danger. This is what happened in the case just stated and it is particularly remarkable because Benny Howard (one of the best) was pilot of the ship and two of the passengers who were overcome—Fred Schnell and R. Nichols—are technical men thoroughly familiar with aviation and naturally on the alert.

The co-pilot thought that his passengers were merely sleeping when he visited the cabin fully one hour before he discovered that they had been overcome. The passengers were removed from the plane and taken to a hospital where, fortunately, they recovered.

Speculating on how such an occurrence could be prevented, it is evident that if the co-pilot were required to spend a certain amount of time at regular intervals back in the cabin with his passengers, and he did not reappear in the "front office" on schedule, the pilot would investigate and find that his assistant was either asleep or that something was radically wrong.

(*Continued on page* 394)

Why Eastward Flights Are Faster

by S. R. WINTERS

New lights on the importance of the prevailing West winds and the part they play in record flights

THE west wind, cold, strong and steady, blows continuously on its endless chase around the world!

Who has not paused, at some time or other, to wonder why the fleecy clouds high above us drift ceaselessly from the west? What persistent air currents carry them on and what is the reason for their being? The story of the west wind, that was so little known and understood before the coming of aviation, reveals some remarkable aerial phenomena.

The winds of the upper regions, which are encountered by all aircraft that fly, hold the interest of everyone and particularly those, who in remarkably increasing numbers, now take to the air. An aviator understands that flights can be made in faster time when he selects a course extending from west to east. He knows that speed will be gained through the kindly aid of the prevailing winds overhead.

And now, in the light of recent events which have thrilled the world, men are looking ahead to the day when aircraft will encircle the globe at tremendous speeds—flying on the wings of the west wind!

While the racing pilot naturally realizes that he gains greater prestige for himself and machine by making his best efforts to the east, he must yield to the other side of the question. An efficient airplane will make slower time to the west, while one of lower efficiency will likely show much faster time when it hurtles into the east.

And most flights of spectacular nature have been made to the east.

This problem, uppermost in the minds of many who question the practical efficiency of aircraft at all times, should not be considered lightly. The elapsed time required to make a flight into the west exceeds by over 17 percent that needed for the eastward journey. Certainly this is a formidable figure to contemplate in this day of rigid economies.

Strato-Cumulus clouds carried by the west wind as seen at sunset.

Actual flights in both directions by the same machines and pilots tell the story of the significant effect of the west winds. The first successful nonstop westward flight of 4,100 miles across the Atlantic against the natural winds was made on September 1-2, 1930 by Coste and Bellonte, in the "Question Mark." Their time was 37 hours and 19 minutes, yet it took Lindbergh, flying the same route to the east several years previously, only 33 hours and 29 minutes.

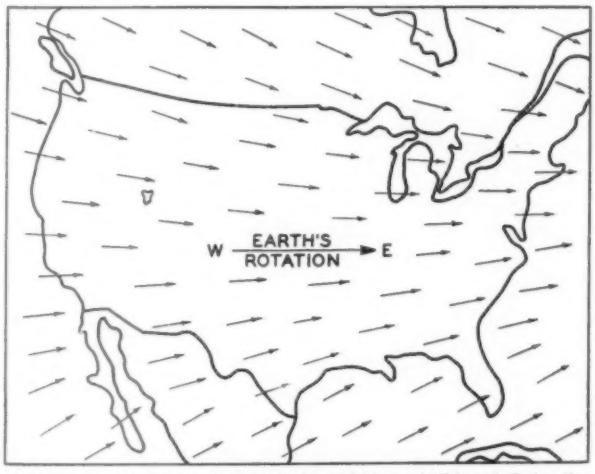


Diagram of the west wind and the relation of this wind to the earth's rotation.

Westward flyers are also compelled to wait longer for favorable surface winds and weather, while eastward flyers have the dependable west wind at their backs along the higher flying levels.

The remarkable flight of Post and Gatty, racing eastward around the world in less than 10 days at a speed of more than 150 miles an hour, demonstrated the assistance of the west wind. But the same flight into the west would require many more hours, and the speed would be materially reduced.

Captain Frank M. Hawks, flew nonstop from New York to Los Angeles on August 6, 1930, in 14 hours and 50 minutes; he returned to New York in 12 hours and 25 minutes. And is still seeking to break this remarkable speed.

A similar flight took Col. Roscoe Turner across the United States in 18 hours and 43 minutes, but he made the return trip in 15 hours and 32 minutes.

As we rise from the surface of the earth, we soon encounter air currents that gradually swing into the west as our plane gains altitude. Blowing continuously at rather high velocities, these winds are simply a part of nature's scheme of things; nothing can be done to change them. But winds on the surface and lower levels aloft are apt to blow from any direction at times.

After years of investigation it has been found that winds from easterly points blow with a frequency of less than 5 percent of the time at most places in America. Therefore, favorable winds seldom assist east-to-west flying. And when this does occur it is almost certain that bad and stormy weather prevails.

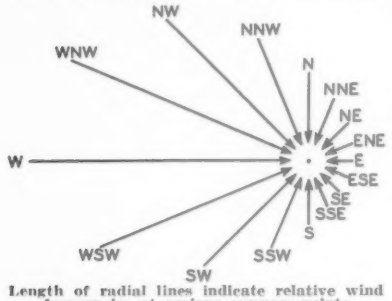
Why, then, are such strong westerly winds encountered as one rises above the surface of the earth? First, consider a simple truth—the earth turns on its axis, spinning from the west towards the east; also, another axiom—warm air expands and rises above the earth as it becomes heated. Strange as it may seem, these two simple facts are the principal reasons why the upper

winds blow steadily from westerly points of the compass!

At the equator heated air constantly arises from the surface of the earth. And it is obvious that this air is compelled to move off from the tropics for it cannot continue to rise indefinitely upward into space. So, constantly pushed on by newly rising air beneath, it naturally turns into the only available directions—north and south.

Theoretically, over America, we should expect to find a steady flow of air moving towards the north pole. But such is not the case, except in the tropics; we have only to watch the movements of high clouds to know that the higher winds flow from the west and not the south.

What changes that original south wind as it comes up from the equator so that it blows from the west? The rotation of the earth has a lasting and definite effect in shifting the wind and heading it into the east. For example: Assume that a powerful gun will throw a shell a distance of 100 miles. Now, if this hypothetical rifle should be aimed north along a meridian and then fired, its projectile will fall to earth many miles to the right, or east of the target.



Length of radial lines indicate relative wind frequencies at various compass points.

The rotation of the earth drags the shell to the right of its target between the time it leaves the gun and is deposited far to the east of its mark. The shell cannot travel straight north and at the same time ignore the pull of the earth that is moving eastward beneath.

For the same reason the northward flow of air from the tropics becomes steadily deflected to the right, or east. Similarly, below the equator, the southbound air is deflected to the left, which also is east. In the southern portion of our country, however, we find winds with a stronger tendency from the south because the full effects of the rotation of the earth are not felt so close to the equator.

As we move farther north, we find the air is pulled more and more to the right, and the direction becomes practically west. In the far north the west winds begin to turn somewhat and even come from the north of west, especially during the winter season.

The rising warm air from the equatorial region, therefore, flows to the poles by a long spiral route around the earth. Over the United States and north Atlantic and Pacific, the winds aloft come from a direction slightly south of west, but from the north of west in the southern hemisphere of the globe.

The Aero-Sportswoman

By JOAN THOMAS

Can these girls hold a successful air-meet? We'll say they can! The group above is composed of the members of the Chicago Girls' Flying Club who opened the eyes of the male pilots at Chicago.

ON THE opening day of the Democratic convention in Chicago this summer, Joan Thomas, piloting an orange-colored plane bearing the word "PEACE" in great white letters, swung lazily back and forth, low over the lake front, to draw attention to the impressive motorcar parade of international disarmament demonstrators. Miss Thomas flies "just for the fun of it".

* * *

Mrs. Francis Marsalis and Mrs. Louise Thaden, who broke the women's endurance flight record recently, called on President Hoover and were photographed with him on the White House lawn.

* * *

A new women's record for a parachute jump was recently made by Frau Lola Schroeder. She jumped from an altitude of 24,250 feet over Kiel, Germany, and landed safely at Kohensberg, 28 miles away, in 28 minutes.

* * *

The Columbia studio in Hollywood has been gathering data and pictures of the authorized air hostesses or stewardesses in this country. One is to be selected and offered a screen part in a picture to be filmed in the near future.

* * *

Speaking on "The Airplane of the Future", William B. Stout once said that the airplane must satisfy women and that for their approval it must be quiet, because, "if any noise is to be made, the woman wants to make it herself".

We object to that last statement of woman much maligned by man, but we will admit, that a lessening of the noise would cut down on the expense of trying to keep a supply of powder puffs to use as mufflers in our helmets.

* * *

Miss Ruth Kitchell, publisher of the *Daily Reporter*, a newspaper at Coldwater, Michigan, the third Michigan woman to be granted a transport license, became the bride of William H. Wakeman of Chicago on Sept. 17.

* * *

All honor to the Chicago girls who put on a premier show in Chicago, this fall. It was purely a girls show, organized by the members of the Chicago Girls Flying club and the crowd were entertained by girl pilots.

And the girls proved one thing if they did not break any records. They proved that an air-meet could be conducted without accidents.

Blue skies, gentle winds, a kindly sun and lots of people. Excellent loud speaker system to announce the events.

National guard planes arrive and salute the girl flyers. Flag raising and women's bugle corps call to the colors.

Civilian pilots' salute of 30 ships spread across the sky.

All visiting ships land and the women take to the air.

Aerobatics, balloon bursting, speed dashes, paper splitting and bomb dropping — the Presidential Race — spot landing contest and a Speed Race for the trophy presented by Sheriff Meyerling.

Comedy—Andy Gump in a Klemm flew for President and won! Roosevelt in a Parks cut several pylons and had to retrace his course losing both time and votes. Hoover in a Commandaire flew high, wide and handsome, disqualifying himself for office many times with his antics.

Thrills and cheers accompanied the Bomb Dropping Contest. Several five pound bags (flour "bombs") landed close to the crowd and no one could tell where the next one was going to hit. A few hit the mark much to everyone's relief.

And the sun set with a smile on the first all-women's air meet.

A New Steam Engine for Aircraft

by ROBERT H. MARTIN

A highly improved steam aircraft plant has recently been developed, which is highly economical in the use of fuel. It promises to be a reliable successor to the present type of internal combustion engine

FLYING from Newfoundland to the Irish Coast at an expense of about $4 for fuel, with the fuel being No. 1 Furnace Oil at that, sounds decidedly revolutionary, yet this is claimed possible if the airplane is equipped with what is declared to be the world's first practical binary steam power engine for airplane propulsion just perfected in Akron, Ohio.

The group of aeronautical engineers, pilots and mechanics engaged for several months in secretly developing the new propulsion unit has announced more than 200 hours of exhaustive tests involving amazing results. Secrecy was observed, it was explained, because of radical departures from the usual type of internal combustion motors.

Some of the advantages represented by the new unit are listed as follows: Extreme economy and simplicity of operation, slow depreciation, reduced fire hazard, noninterference with radio reception, absence of vibration and silence of operation, lightness, quick starting under all weather conditions and comparatively few moving parts.

The demonstrating engine, of 24-inch overall dimensions and maximum capacity of 90 horsepower, weighs but 61 pounds. With generator and automatics, the total dry weight is 150 pounds.

The engineers will not reveal the valve mechanism, nature of the chemicals used to replace water, nor the means for absorption of radiant heat in coils which produces over two and a half horsepower per square foot of heating surface.

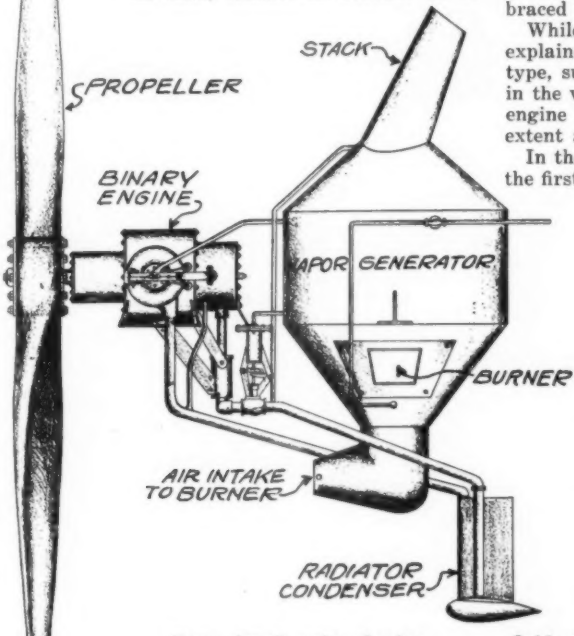
Not only does the new unit promise to effect quick revival of the aeronautical industry, but is to have a wide range of utility in other fields as well. A production of units having from 60 to 500 horsepower capacity is planned, according to Duncan MacDonald, Pittsburgh automotive engineer and technical adviser for the experimenters.

Two of the other important uses of the new motor will extend to dirigible and bus operation, MacDonald predicted. In the latter connection, he said that fuel oil would be used instead of furnace oil, the prominent feature being an absence of obnoxious exhausts so complained of in cities.

Harold C. Johnston, Akron aviator and proprietor of a welding shop, is inventor of the unit, which is being installed in a Cadet monoplane designed by V. C. Babcock, Akron aeronautical engineer.

"The new unit offers great simplicity of construction, having few moving parts and increased safety at slightly less weight and displacement than the internal combustion motor of equal horsepower rating," MacDonald said.

"In tests, commercial furnace oil at seven cents a gallon was used to the exclusion of 68 to 76 octane equivalent gasoline at 30 cents a gallon. The many thousand additional B.t.u. per gallon in favor of the cheaper fuel and the use of high pressure steam in the specially built two-cylinder motor, produced an almost inconceivably high thermal efficiency. Control of steam temperature and feed-water to generator is had by specially designed thermostat. Steam to motor is by manual control.



Steam aircraft engine, showing the various units in their proper relation.

"The motor can be operated for indefinite periods on wide-open throttle, which is impossible with the conventional type of internal combustion motor.

"After dismantling the motor for the purpose of securing scientific measurements on which to determine life of the unit, it was found to compare favorably with the high-speed stationary steam engines which have been known to operate continuously, 24 hours a day for many months, without attention or overhauling, whereas life of the conventional type of internal combustion aeronautical engine is approximately 1,000 hours, during which time at least three major overhauls are required.

"The unit eliminates use of lubricants, since the binary compound embraced is itself a lubricant."

While the cycle of operation is not explained, the fact that it is a "binary" type, suggests the use of two fluids as in the well known mercury type binary engine which has been used to some extent as a stationary engine.

In the simpler type of binary engine, the first fluid (such as water) is vaporized at a high pressure in a boiler and then passes to the engine in the usual manner. When the vapor passes out of the exhaust, there is still some heat in it, and this heat is used to vaporize a second volatile liquid having a lower boiling point than the water.

The second liquid, usually ether or butane, is heated by the exhaust to a high pressure, and this vapor in turn goes to a second cylinder where more power is developed. Thus, this system is more economical than the single fluid engine because more of the heat is utilized for power.

The present day single fluid steam engine, using water vapor alone, has an efficiency below 15 per cent. In other words, 85 per cent of all the heat supplied to the engine by the fuel is wasted in various ways, largely by the high temperature exhaust steam that escapes to the air, taking the heat with it.

This loss is reduced to some extent by condensing the steam, but even then, the efficiency of the single fluid engine is considerably below that of the internal combustion engine as now built.

There are a number of different binary systems which have been proposed or experimented with from time to time, the best known being the old Stillman binary engine of the water-ether type.

XUM

The Italian Speed Marvel—the Pegna Pc-7

by FLETCHER PRATT
P. A. Correspondent, Paris, France

A revolutionary design in a super-speed seaplane. Unfortunately, the designer of this craft would not permit our correspondent to photograph the Pc-7, but allowed these sketches to be made

A COMBINATION of the principles of aero- and hydro-dynamics, already theoretically familiar to scientists but never before employed in combination or in a practical way, has resulted in the invention of the latest speed marvel of the aviation world.

This is the remarkable Pc-7, invented by Dr. Giovanni Pegna, which after considerable success in preliminary trials, is now undergoing final alterations for a crack at all existing world's speed records.

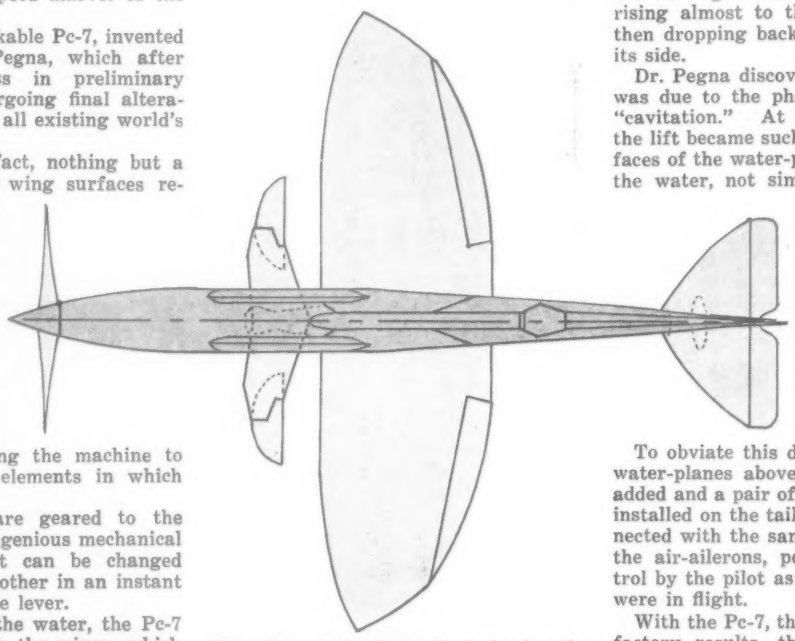
The Pc-7 is, in fact, nothing but a flying torpedo with wing surfaces reduced to a minimum. The heavy air-resisting floats, which impede the speed of most seaplanes, are almost entirely eliminated. It is provided with an 850 h.p. Isotta-Fraschini motor which drives both air and water propellers, permitting the machine to navigate both the elements in which it is at home.

Two propellers are geared to the same motor by an ingenious mechanical arrangement and it can be changed over from one to another in an instant by throwing a single lever.

While at rest in the water, the Pc-7 sinks low down with the wings, which are set far back on the torpedo-like body, just resting on the surface. At this stage, the motor is connected with the water propeller. As it comes into action, the machine begins to rise on its floats 'till it is barely skimming the surface, the air-propeller is thrown in and the giant torpedo soars away into the atmosphere at a speed in excess of 350 miles an hour.

This remarkable method of operation is made possible by the construction of the floats. Instead of the usual seaplane floats, these are nothing but "water-wings" thin aerofoils of very reduced surface which have no part in supporting the machine when at rest. They are constructed on the principle of the supporting "water-planes" used on the motor-boat with which Alexander Graham Bell was experimenting at his death.

The action of these floats in the water is like that of an airplane's wings on the air. At high speeds, they produce a powerful lift which causes the Pc-7 to rise to the point where the air propeller will clear the surface. At this point the air propeller is thrown in and the machine takes off.



Plan view of the Pegna Pc-7 showing the peculiar wing form and the water-plane in advance of the main wing.

In the Pc-7, there are three sets of these "water-wings"; two well forward in the usual position of a seaplane's floats and a third set under the tail—just forward of the water propeller. This third water-wing is flanked by two smaller members of the same type, higher up on the body of the machine. The forward water-wings are set at a steep angle to the transverse axis of the machine in order to give it stability in the water.

The number of the Pc-7 indicates that it is the final product of a series of similar machines, most of which never got beyond the model stage and in which the problems of treating the water like air and flying through it on wings were carefully studied. In the earlier machines, in which floats of the ordinary seaplane section were used, great instability was noticed when the machine reached high water-speeds, the machine rising almost to the taking off point, then dropping back or turning over on its side.

Dr. Pegna discovered that this result was due to the phenomenon known as "cavitation." At high water-speeds, the lift became such that the upper surfaces of the water-planes emerged from the water, not simultaneously, but as the waves struck one side or the other. As the water on the upper surfaces of the planes was replaced by air, the lift dropped and the machine reeled violently to the side on which the phenomenon had taken place.

To obviate this difficulty, the smaller water-planes above the tail float were added and a pair of water-ailerons were installed on the tail float itself and connected with the same set of controls as the air-ailerons, permitting their control by the pilot as though the machine were in flight.

With the Pc-7, this gave wholly satisfactory results, the machine showing instability only at very low speeds between 18 and 22 miles per hour. Dr. Pegna reasoned, and experience proved him right, that the pilot would be able to control the machine at these velocities through the use of the rudder.

In addition to its basic principle, the Pc-7 presents many other new and original features of construction. The fuselage is made entirely of welded metal plates, the exterior surface being divided into numberless tiny water-tight compartments to insure the safety of the ship. These compartments, and the divisions between them, are constructed of duralumin and make the whole fuselage watertight, at the same time insuring that the machine will possess adequate resistance to the shock of the water on landing. Wings and ailerons are likewise made watertight by weld-

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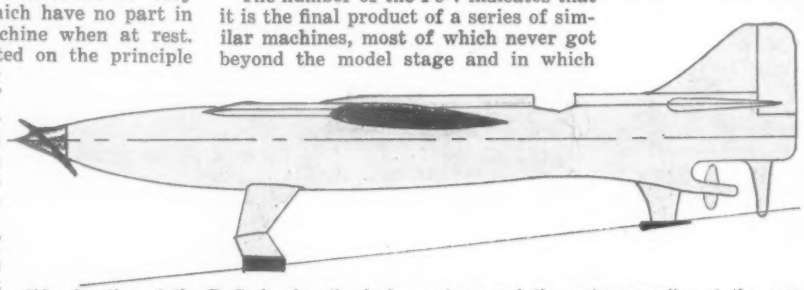


Side elevation of the Pc-7 showing the hydro surfaces and the water propeller at the rear of the fuselage. Note the peculiar slender body.

Putting Pants on the Lightplane

by JOHN B. RATHBUN

John Smith, our hero, gets his lightplane in line with modern aeronautic progress and provides it with pants, thereby materially improving its performance

JOHN SMITH, lightplane builder and aviation enthusiast in general, finds that his lightplane is not kicking along fast enough to suit him. He hasn't much power to begin with, say about 30 rated horsepower or 25 actual horsepower, and his purse is in such a depleted shape that it will not yield the wherewithal for a new engine. Tough luck, old-timer, but let us look her over and maybe we can discover ways and means of conserving power even though we can't increase the output of the kicker itself.

We will drop the matter of the propeller for the time being, for it is a standard make designed for this particular outfit and should therefore be above suspicion until we have just cause to accuse it. The engine is in mighty good shape so that lets the engine out and brings us smack into the matter of drag and head resistance. And now let me start looking her over.

Speaking personally and only unto mine own ears I don't like the wing or the wing section but why bring that up when building a new wing would cost almost as much as a new ship? I hate to say "Fine ship—shoot her into the ash can" so I continue my tour around the old crate to see whether some minor and inexpensive alterations might not help in giving her more speed and a better climbing rate.

The outline of the fuselage looks rather sour too, and if this is a streamline body then I am a Swiss watchmaker. All kinds of doodads hanging in the wind-stream, engine not sufficiently cowled and a whole lot of other errors that might add a few more M.P.H. if they were cleared out. To cap the climax is a large "Kewpie" doll lovingly hung up where the slipstream can catch her, creating more head resistance than the rest of the ship together.

Here is Benny Howard's lightplane "Ike," which has been provided with "spats" but not grownup pants. Even the spats improve the performance of the plane.

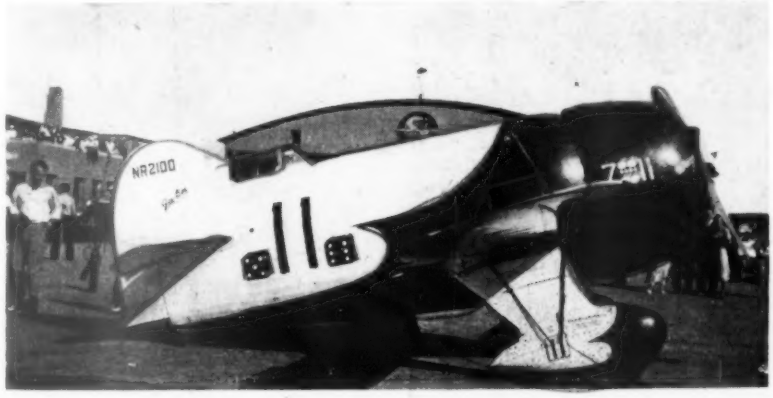
After making a few cracks concerning the rubbish above decks, and knocking out the Kewpie mascot, we take a look below. And here we find something that won't take much time nor a fortune to improve. It is the landing gear that is now built on the general plan of Brooklyn bridge and productive of more head resistance than a man's size barn door in a cyclone. Big fat struts, thick enough for a tri-motor Fokker, big heavy cables running this way and that, and an axle big enough for a Mack truck. "Here's where we will start," say I to myself, "and if streamlining this rubbish don't make her step out we have struck a hopeless case."

It was quickly agreed to reduce the size of the axle and to rearrange the more obstrusive bracing wires and other knick-knacks, but when the real offender was condemned—the landing gear struts—I met with sudden and violent opposition. John Smith absolutely and positively refused to part with his twin oak trees. He would even stand for new wings, but the elephantine legs on the landing gear were his pets and hobby. After some hopeless argument about trimming the struts down within reason, I struck the idea of providing them with "pants" just like those on a real ship, and often referred to as "harem skirts" by the old timers who remembered the Breguet in its infancy.

For some reason this struck Smith's fancy. He was one of the kind who could be indueed to add on trinkets but who hated to depart from any of the paraphernalia once it was installed. It was decided to add the pants, clear out useless braces and struts, and to streamline the wheels, and so agreeing, I left him to his own devices for a couple of weeks.

The pants, be it understood, were simply streamline coverings placed around the landing gear members so as to decrease their resistance and thus increase the speed. In this particular case, thin cedar formers were cut out to streamline form, tacked to the chassis struts and then covered with doped linen. If it did nothing else, it covered up the crude fittings, the unsightly welds and the humpy carpenter work.

Two weeks later, I returned to Smith's hangar to learn what had transpired in the way of speed since our last meeting. When he saw me coming, there was a wide grin upon his countenance and he pointed to a half dozen other lightplanes standing



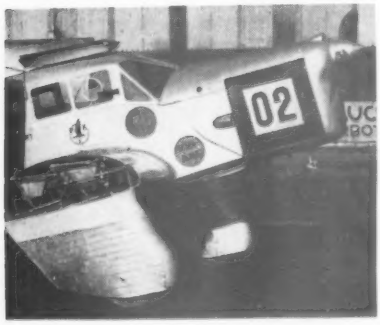
And here we have a Gee-Bee in all its glory with full pants and spats together. This combination materially improves the performance at any speed above 60 m.p.h.

about—each and every one equipped with pants complete.

"Them pants are hot stuff," quoth Smith enthusiastically but ungrammatically. They are just like finding five horsepower. The best that I could do up to the time that the change was made was 76 M.P.H., but now I'm doing 82 M.P.H. regular."

"Any time that I find a way of adding six miles to the speed without a bigger engine or burning more gasoline, I'm strong for the idea—you bet. The gang around here nearly busted themselves laughing when the crate first walked out with her new panties on, but the laugh is on the other sides of their faces now. If you don't believe it, look at the pants on their ships."

Sure enough, five ships and five pairs of pants thereon. Silly looking but efficient. With the exception of two planes, they were equipped with wheel streamlining which was said to help a lot except that they were not very nice in weeds or mud. This combination had so reduced the resistance, and so added to the reserve power that one owner claimed an increase in the climb-



This German lightplane has pants what are pants in the fullest sense of the word.

ing rate of 100 feet per minute. Before the pants were added, his ship climbed about 450 feet per minute which was increased to 550 feet per minute after the pants were in place. They helped—there is no doubt about that—and further, they seemed to improve the control of the two parasol type monoplanes.

"And talk about take-off," continued Smith, "she jumps off the grass in jig time, 'specially against a good stiff breeze. I used to run the legs off her to get off before I ran into the rough, but now there is no trouble at all except when I try to take-off across the wind. Then, not so good. Just as I say, its like finding five horsepower, and I would put pants all over her if I thought it would do any good. Say fellow, do you think that a little embroidery around the bottom would help any?"

Well, it's funny what a little simple inexpensive change like that will do in the way of improving performance. The lightplane has no power to waste at the best, and when a little streamlining can be done it certainly helps.

A Controllable Pitch Propeller

Jimmy Doolittle and his Smith Propeller.

IN MANY ways, a controllable or variable pitch propeller can be compared with the transmission of an automobile.

It permits the engine to speed up and thus develop more power at low plane speeds and then the pitch can be increased at high plane speed just as the change gears of an automobile are thrown into "high".

There have been many more or less successful attempts at varying the propeller pitch while in flight, but the Smith controllable pitch propeller has proved its worth on Jimmie Doolittle's ship, which recently established a world's record for land planes by flying 296.287 m.p.h. This propeller was also installed on the winner of the 1932 Thompson Trophy.

It is arranged so that the blades can be controlled from the cockpit at any time by the pilot. The pitch is reduced for take-off or climb while it is increased for normal or high speed flight. The blades are turned by engine power with the very high gear ratio of 18,000 to 1.

The operating mechanism consists of a nest of worm gears so that the blades cannot "back up" and change pitch accidentally, which is an important feature.

No Ban Now on Movie Stars Flying

IN SHARP contrast to a few years ago when movie stars' contracts prohibited them from riding in airplanes is a general use of this form of transportation by film celebrities, shows a compilation made by United Air Lines of prominent movie people who travel by air. Among recent travelers were: Douglas Fairbanks, Mary Pickford, Richard Barthelmess, Will Rogers, Ann Harding, Everett Horton, Wallace Beery, Lil Dagover, Lawrence Tibbetts, Nancy Carroll, Dolores Del Rio, Bebe Daniels, Lupe Velez, Zazu Pitts, Victor McLaglen, Claire Windsor, Harry Langdon, Sally O'Neill and Marie Duncan.

The NB-8 Trainer Sold Direct From Factory

THE NB-8 parasol type monoplane trainer, first placed on the market in 1931 by the Nicholas-Beazley Co., Inc., will now be sold directly from the factory instead of through dealers and distributors.

By eliminating the middlemen's profits, it is possible to sell this well known training plane at $1490.00, or exactly $500.00 less than was possible under the former sales plan. This is a marked saving that is passed on to the purchaser and has received very favorable attention.

The NB-8 trainer has many interesting features of construction, such as the side-by-side seating arrangement, folding wings and air-wheels in combination with oleo shock-absorbers.

It has a top speed of 110 m.p.h., a cruising speed of 92 m.p.h. and a landing speed of 38 m.p.h. with full load. It has an exceptional degree of stability and is easy to control.

About the Triangle Army Chute

MUCH has been said and many predictions have been made for the future of the new triangular army chute, but this is the first time that we have been able to show a "close-up" view of the chute in action.

Recent tests by the Army Air Corps indicate that the chute is a great improvement over anything that has been tried out so far. It has a slower, more even rate of descent as the "opening shock" is less than that of the round type. Further, it is more easily maneuvered in the air by manipulating the shroud lines for it is easier to "spill the air" along the straight edges.

As will be seen from the accompanying photo, the plan form of the chute is actually triangular.

Dropping earthward with an Army Triangle chute.

Simple Lessons in Meteorology

by JAMES A. SIMPSON

And here, Charley confronts friend Jim with a real weather-map and tells him what it is all about and how to read it

Dear Jim:

This lesson is going to be a tough one, Young Feller, so I suggest you take up a few notches of slack in the old belt and get that two-bit abomination of a pipe you smoke filled for a long haul.

Fact is, Jim, I've been going kind of easy on you thus far, realizing that you are still pretty much of a greenhorn. Then too, I have kept in mind the fact that you haven't had much of a yen for this meteorology end of your ground school training. So I've slipped it to you in homeopathic doses.

But from now on I'm going to give you the practical dope that will come in handy when you are doing real, honest-to-gosh thinking of your own, without any one to tell you what to do next. When that time comes, Jim, I want you to know that my old heart bleeds for you, if its any consolation to you to know it!

In my last letter I covered so much ground, or rather clouds, that I didn't have room to squeeze in the really important thing about 'em: How they show up on the weather map or on reports from weather stations.

I apologize, Jim. I realize that not even your giant intellect is going to be able to recognize "ACu" as representing Alto-Cumulus when you meet it on a dark and stormy night. To make amends I'm giving you a list of all of the symbols used in identifying cloud forms.

If I were you I'd make it my business to memorize these right away, which, being translated, means now, today, right off the bat. Here they are:

Cirrus (Ci); Strato-Cumulus (StCu); Cirro Stratus (CiSt); Stratus (St); Cirro Cumulus (CiCu); Cumulus (Cu); Alto Stratus (ASt); Cumulo Nimbus (CuNb); Alto Cumulus (ACu); Nimbus (Nb).

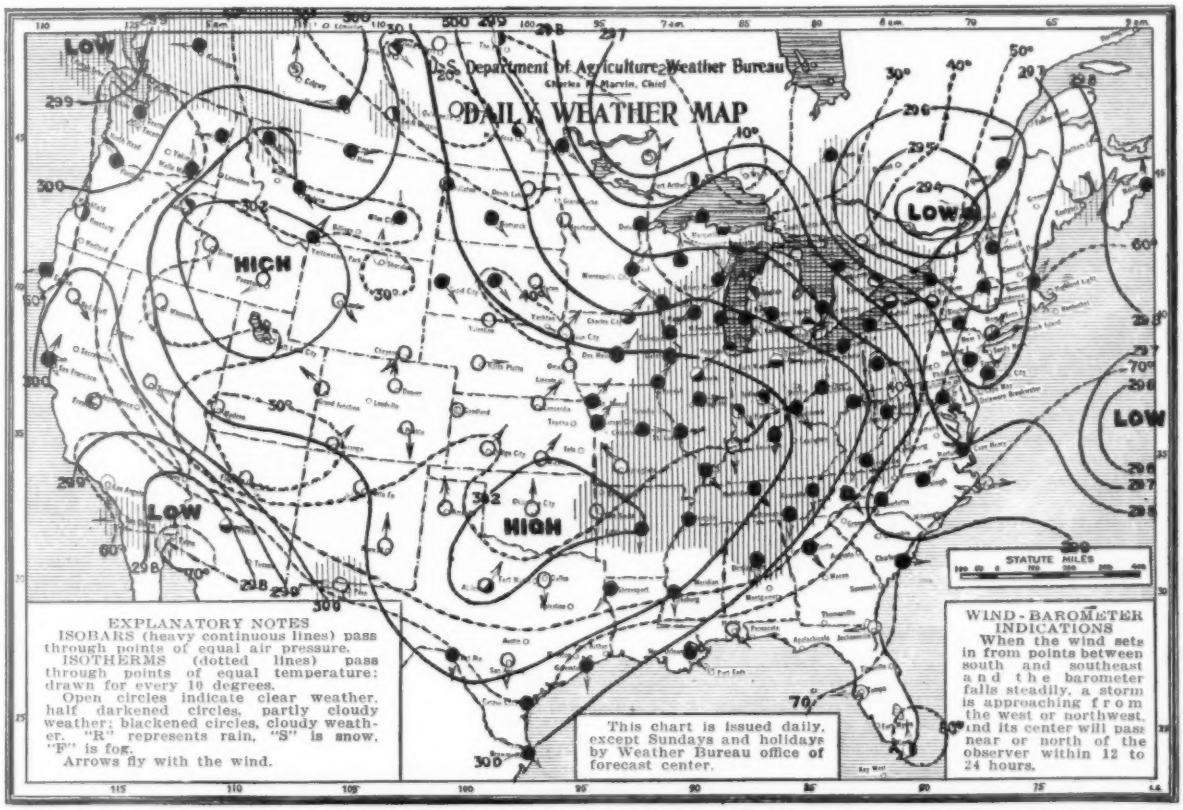
There is another bunch of meat I want you to sink your teeth in, Jim, and that has to do with visibility. Here again you'll find it a blamed good policy to memorize the whole works.

In case you didn't know it, Jim, there is in existence an International Scale for checking observations of horizontal visibility, based upon the distance at which objects can be distinguished. The code number is handy and useful.

International Visibility Scale

Code No.	Objects not visible at	Description
0	55 yards	Dense fog
1	220 yards	Very bad
2	550 yards	Bad
3	1,100 yards	Very poor
4	1¼ land miles	Poor
5	2½ land miles	Indifferent
6	6¼ land miles	Fair
7	12½ land miles	Good
8	31 land miles	Very good
9	Visible beyond 31 mi.	Excellent

Knowing your sarcastic disposition, I can hear you ask yourself "howinell am I to know what 550 yards is!" when estimating range of vision. The answer is that you are to guess as close as you can, and, when in doubt, be conservative, which is always a


U.S. Department of Agriculture—Weather Bureau
Charles F. Marvin, Chief
DAILY WEATHER MAP
LOW
HIGH
LOW
HIGH
LOW
EXPLANATORY NOTES
ISOBARS (heavy continuous lines) pass through points of equal air pressure.
ISOTHERMS (dotted lines) pass through points of equal temperature: drawn for every 10 degrees.
Open circles indicate clear weather, half darkened circles, partly cloudy weather; blackened circles, cloudy weather. "R" represents rain, "S" is snow, "F" is fog.
Arrows fly with the wind.
This chart is issued daily, except Sundays and holidays by Weather Bureau office of forecast center.
WIND-BAROMETER INDICATIONS
When the wind sets in from points between south and southeast and the barometer falls steadily, a storm is approaching from the west or northwest, and its center will pass near or north of the observer within 12 to 24 hours.
STATUTE MILES

A standard U. S. Weather Bureau weather-map showing the various features discussed by Charley. This particular map was taken during the recent hurricane in the West Indies, and the "low" that indicates this storm is shown at the hand edge of the map.

good bet, whether you are in the air or crossing the street on foot.

So try to register these facts and figures in your brain for the good of posterity, if any:

Now, Jim, suppose you wanted to determine cloud height or ceiling, how would you go about it? I can almost hear you say "I'd send up a balloon." Sure thing, that's one way to do it. But you've got to know the balloon's ascensional rate in order to do the trick.

This reminds me of an experience I had the other day. I got into one of those high speed signal-controlled elevators in a tall building downtown. As I had my mind on meteorology or homebrew or something really important, I forgot to call my floor until the car had snuck up fairly close to it.

When I saw the little light dingus over the door skip past 19 I gave a yell for number 24. Believe it or not, the operator couldn't stop the car with the push button quick enough, and he ran clear up to 27. He turned around and told me I'd have to call my shots five floors ahead as the elevator was a-thousand-foot-a-minute type and overran stop lights unless they were punched on his adding machine control plenty pronto.

You see this hombre knew his ascensional rate, which is what you have got to know with a ceiling balloon in order to determine cloud height. Given that dope, and the old stop watch on the elapsed time from release to disappearance in the clouds, it is a simple matter to figure out the ceiling.

Other methods are: By triangulation with two theodolites a known distance apart; by measurements with a rangefinder; and at night, by using a searchlight to throw a spot on the cloud, where the angle of the beam of light and the distance of the light from the observer, are known.

You may have been wondering where the tough part of this so-called lesson comes in. In case you feel pretty chesty about keeping ahead of me thus far, let me ease it to you that I've been saving the weather map data for the latter part of this screed, to give you something really worth worrying about. So let's go, Old Timer, and for gosh sakes, concentrate!

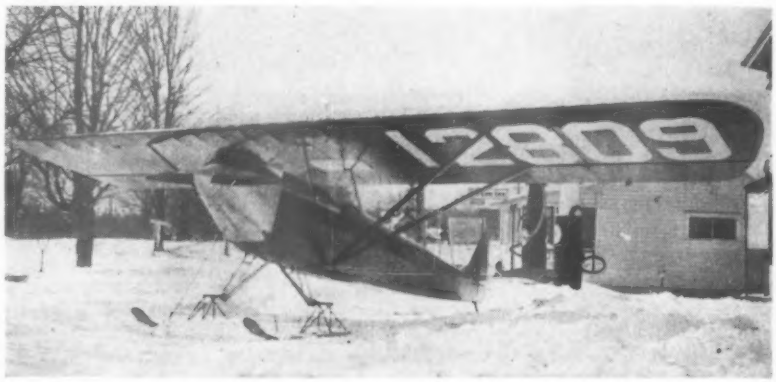
You've got to know how to read a weather map, Jim, and you also should be able to make one. However, I'm not going to insist upon it, for I imagine you'll have to make plenty out there where you are before you pass your meteorological test, and I still value your friendship!

Weather maps, as even a dumb bozo like you must know, are designed to reveal a pile of information for comparatively large areas, *at a glance.* A weather wise pilot can take one good look at a weather map, casting his eagle eye over several thousand square miles of territory, and yell: "My gosh! A hurricane approaching the coast of

(*Continued on page* 392)

Howl Department for Amateurs

A department organized for the discussion of amateur aviation problems by our readers.



How long must this winter sport be postponed, the sport of lightplane take-offs from snow and ice?

AND they continue to come in, letters with all sorts of ideas and suggestions for annulling or modifying the laws now passed or about to be passed that threaten amateur aviation.

There have been howls, yodels, twitters and chirps all aimed at the same purpose—the demand that home-building of lightplanes be relieved from the legislative burden now resting on its neck. There have been enough comments to date to start a new political party for the next campaign, and as a matter of fact, we can't see why this cannot be made a campaign issue as well as its brother—the prohibition act.

Now, bear in mind that January 1, 1933—just one month from the date that this issue reaches the news stands, will see the enforcement of new Federal aviation laws as well as new state laws, so get together and notify your friends and bond them together to resist this imposition that is being leveled on the amateur and experimenter.

And just one thing more. Be sure to read the excellent article in this issue by Leslie Long, one of the best known of amateur lightplane designers and builders.

* * *

NOW we will examine into a comment by Dahmer Kam, 524 12th Street, Oshkosh, Wis. He is firmly against the taxation idea promoted by S. R. Jacobs as will be seen. Here he goes:

The article written by Douglas Van Horne in your last issue seems to fill the bill as close as possible for amateurs.

I am strictly in favor of the things he specified, but for the love of Pete don't let fellows like S. R. Jacobs of Pryor, Okla., get any further than he has. I wonder what got the best of him. Does he hate us all? Or is it the home-brew?

Taxes, taxes, that is all we hear. You cannot turn around in bed without someone want to slap a tax on you. As far as the grounded ships are concerned. If they don't pass the requirements of an inspection to see if they are airworthy I am in favor of keeping them grounded.

I am strictly against stress analysis. All we need is good workmanship, high grade aircraft steel, bolts, etc., and common sense. Coupled with the proper design, this is very important. There is no sense in letting someone build a ship with large wing-spread and small controlling surfaces and low power. This is just as bad as using haywire. The results are the same.

I think it would be a great idea if you would publish a form in your magazine for us to fill out and send in to the Department of Commerce.

As soon as we get enough data from the letters that come pouring in, and have a chance to sum up the evidence, we will print a petition form or blank to be sent to the Department of Commerce and other bureaus.

* * *

AUSTIN B. LINSCOTT, Cambridge, Mass., writes interestingly upon the situation. Here's his letter.

I was on the point of building a ——— monoplane, but when I was informed by the local authorities that it was unlawful to fly it, I gave it up for the present.

In my opinion, a logical method of attack upon this situation would be to print an article exposing those who are responsible for these conditions. Is it the political pull that the leading aircraft companies have that has brought about these unjust laws?

I would like to suggest that Hiram Bingham may be the man to present our petitions before the proper legislative bodies after the election. Then to sum up my two suggestions:

(1) *To have you (P. A.) identify the unpopular parties responsible for the restrictive laws.*

(2) *To have Senator Bingham lead us in our efforts to do away with these laws.*

(*Continued on page* 405)

Cold Weather Hints for Frigid Flyers

by T-2003

Here are some mighty useful tips for the pilot who braves the winter blasts with his trusty ship. These hints are based on long experience

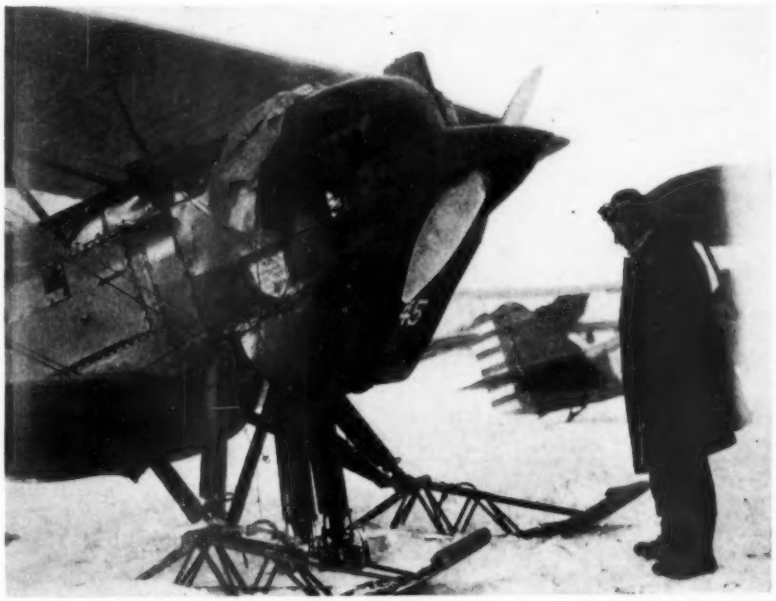
WINTER is here and in the Northern states and the provinces of Canada, airplane skiis will soon make their appearance. Also cold weather troubles—human and mechanical. As a human sufferer from my own and my airplane's troubles, let's pass on some tips.

What makes the best ski, that is, the ski-shoe, a corrugated or a smooth surface, a heavy steel or light alloy material, canvas or tin pants for the struts or no pants at all? And how to pull up the nose of the skiis so the runners stay parallel to the line of flight when the airplane is in the air —by rubber shock absorber cord or steel spring?

And how about the flying end of it? What sort of snow is the best to land on or take off from? What does a good snow surface look like? How about motor heating and goggle frosting, ice on the wings and struts and a host of annoyances that may become troubles if not circumvented?

When the First Pursuit Group at Selfridge Field took a winter trek through the Northwest three years ago, the pursuiters started out with first class skiis, light and stream-lined. If they had only encountered soft "packing" snow, all would have been jake, but wind had swept one gravelly field and bared large spots on it. The gravel wore the alloy shoes almost through.

The next field was entirely snow-covered, but the snow had a thin icy crust, which broke through and gouged out the already thinned ski runners until they were, as Major Ralph Royce said, "more like snow plows than snow skiis." He opined that steel runners while heavier, would have been better for standing the wear and tear of varied fields.



Army Air Corps Photo

Taking a look at the new skiis, recently developed and found satisfactory for winter take-offs and landings.

On the same flight, an amateur wireless operator at one field, one of the many wireless "hams" who kept track of the flight, wrote me that he helped pull almost 100 pounds of ice and snow from inside the canvas streamline pants around the landing gear struts. From a friend in Canada comes a similar plaint about "tin pants," that the advantage of streamlining is negligible beside the disadvantage of snow that drifts inside the pants and adds weight there. Especially where slush squirts up inside the streamlining as the plane taxis around the cut-up snow near the hangars, as this slush freezes as soon as the cold air strikes the plane when it is in flight.

Army Air Corps Photo

Showing the result of parking a ship on the ice overnight. The weight of the sleet on the wings has caused the ship to break through the ice.

THE "toes" of most skiis must be pulled up while the plane is in a flying position, so that the ski is parallel to the line of flight. This for two reasons, first, the skiis streamline themselves while the airplane is flying and second, that they will not "toe-under" if the pilot makes a slightly tail-high landing. Rubber shock absorber cord is sometimes used, but if this cord is not released after flight it will lose its elasticity or break if kept in the cold under tension for any length of time.

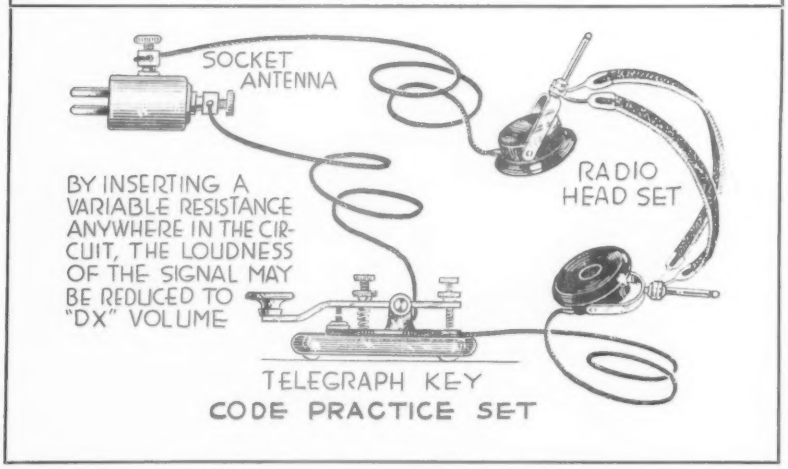
This precaution is apt to be neglected, and a pair of skiis with the toes suddenly dropped due to the failure of misused rubber cord, are apt to cause extreme nose heaviness in the air and a nose-over when landing. Most professional parachute jumpers, who have worked in extreme cold in winter and at high altitude, are usually well aware of this property of rubber elastic and sometimes use coil metal springs in addition to the rubber snap-open cords. On skiis, vibration and cold are apt to be a bad combination for a steel spring but springs, however, are usually considered a better medium than rubber cord.

(*Continued on page* 390)

A Page of Practical Mechanics

Brevities of practical use for the amateur mechanic and experimenter who like to tinker.

A Simple Radio Code Instructor


SOCKET
ANTENNA
BY INSERTING A VARIABLE RESISTANCE ANYWHERE IN THE CIRCUIT, THE LOUDNESS OF THE SIGNAL MAY BE REDUCED TO "DX" VOLUME
RADIO HEAD SET
TELEGRAPH KEY
CODE PRACTICE SET

FOR learning code, the usual equipment is a telegraph key, a buzzer and a battery. With an alternating current lighting circuit available, a much simpler arrangement may be rigged up.

There are on the market many forms of so-called "socket antenna" for radio sets, a little device which plugs into a light socket and has one or two binding screws for the attachment of wires. This device takes the place of the buzzer and battery.

One cord tip of a telephone head set is connected to one of the binding posts on the socket antenna; the other cord tip is connected to a telegraph key; the other side of the key is connected to the other binding post on the socket antenna. When the key is pressed, a note of 120 vibrations a second is heard in the head set.

This is rather a low note being more than two octaves below middle C on the piano, but one can learn the sound of dots and dashes with it as well as with an oscillating tube. If the socket antenna available has only one binding post, connect the other side of the key to ground; that is, to a water pipe or steam radiator.

If that does not work, turn the socket antenna around, so that its prongs are transposed, because one side of the electric light circuit is grounded.

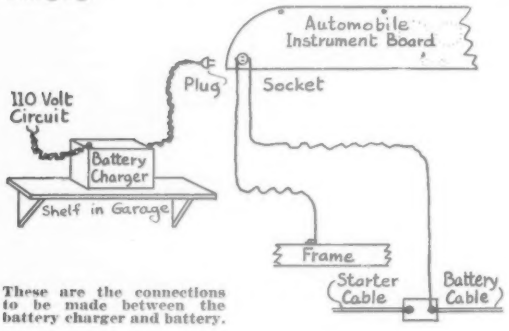
Charging Your Automobile Battery

NOTHING is more irritating than to have your car battery run down to the point where it will not start the engine. If you have no charger, then the battery must be removed from the car, taken to the service station and laid up for two or three days while charging.

Now all this can be avoided by purchasing a radio battery charger for a few dollars, and using this to refresh the battery at night while you sleep.

Only a few changes are necessary. Place an incandescent lamp socket or receptacle on the dashboard of the car, and to this socket run wires from the car frame and the undergrounded side of the battery.

Now place the charger on the shelf, provide the "output" side of the charger with a plug. When you run the car into the garage at night, all you have to do is to plug in the starter, turn on the juice, and forget your troubles. The next morning the battery will be fresh and strong.



These are the connections to be made between the battery charger and battery.

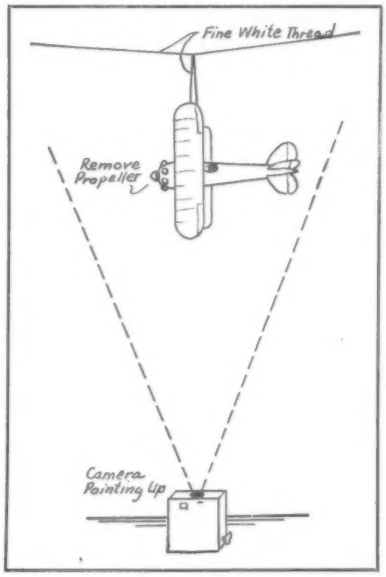
Making a Camp Stool

Here's the egg-box camp stool.

THIS is a camp stool made from an old egg crate. It is so simple that it is hardly necessary to say more about it.

Faking Model Photos

SOME interesting photos can be made of models, posed as though in flight. You have seen such photos in this magazine. Hang the model in the desired position with a thin white thread, point the camera upwards at it—and there you are.



Imitating a flying model.

Converting Ford Model "A" Engines

by B. H. PIETENPOL

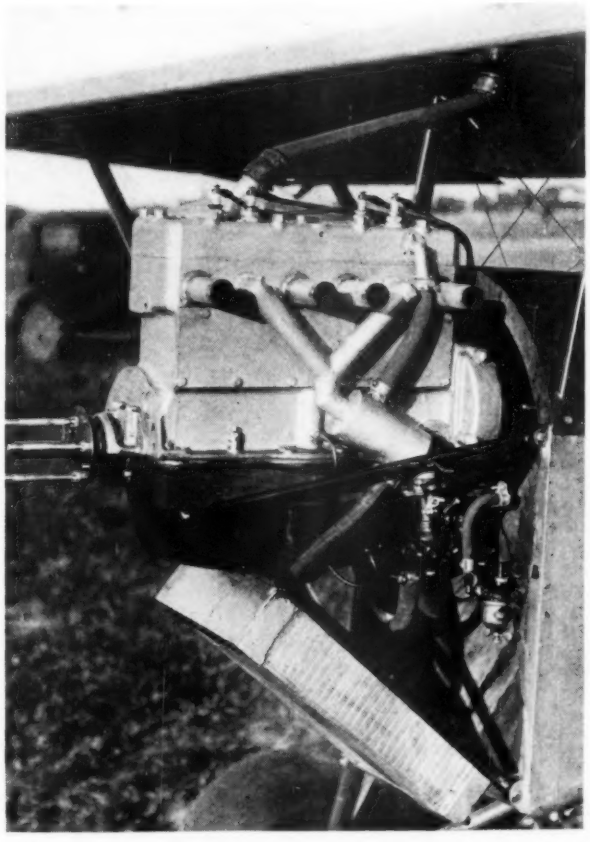
PART I

The author, an acknowledged authority on the conversion of Ford engines for lightplanes, explains the first steps in rebuilding the Ford Model "A" engine. Detailed drawings of this job will appear in our next issue

PROCURING an engine for a lightplane is undoubtedly the greatest financial problem that the amateur builder must face in constructing his ship. The prices of the light aviation engines of standard design are prohibitive for most amateurs, hence they must look to some other source of power—mostly to converted automobile or motorcycle engines.

Now almost all sorts of automobile engines have been converted into lightplane engines, Ford engines, Chevvy engines, Velie engines, British-American engines and Franklin air-coolers, but, of course, the greatest interest attaches to the Ford engines for the reason that they are the cheapest and most easily available of all the types mentioned. A Ford engine can be picked up in almost any town at a very reasonable price.

Of course, there is a considerable amount of work connected with converting a Ford engine into a lightplane engine, and some expense, but in the writer's opinion the work and expenditures are well justified in view of the results obtained. Many men are successfully flying with converted Ford engines and in many cases this engine has been the means of its owner gaining very valuable flight training and experience at a very reasonable price.



Left side of the converted Ford engine and its connection shown mounted in a Pietenpol plane.

I have been experimenting with Ford motors in lightplanes ever since 1920, and successfully flew a small biplane with a Ford Model "T" engine during 1920. Therefore, I hope that the experience gained in all those years will be of use and benefit to the readers of POPULAR AVIATION, and I will tell them what to expect and what not to expect from these conversions.

It was in the winter of 1928 that we flew our first ship powered with the Ford Model "A" engine. This latter ship was a success from the first, and while it was 50 pounds over the weight of our later ships, and had a smaller wing area, yet we carried loads of nearly 1,000 pounds (total weight). The old Lawrance propeller was used, and also, the regular Ford "A" cylinder-head. A gross weight of 1,150 pounds has been flown cross country with a later ship.

Since that first Model "A" job, we have put in over 1,000 hours, and in all that time have had only one forced landing. This latter trouble was due to a magneto failure and was not chargeable to the engine in any way. We have never had a burned valve or a loose bearing, and although one engine has had about 400 hours on it, it turns up better than when we first started using it. This is a record that is hard to beat with any engine.

Now, I know that there are a lot of pilots and aviation experts, that should know better, who will say that these engines are not reliable, but if you have made a good job of the conversion, I believe that you will have the most dependable aviation engine in existence. The lubrication is most simple for it is only necessary to pour oil in the engine crankcase every 20 hours and oil the magneto every 20 hours. And again, this engine does not spray the ship with oil like most standard aircraft engines.

All in all, there is only one argument against the use of the Model "A" Ford engine. It is too heavy for the amount of power that you get from it. As a result, the plane must be built very light and strong if you expect it to put up a good performance, but this construction is highly practicable if gone about in the right way. It can be built light and yet strong enough to resist any ordinary flight test that can be put on it.

You can build either a high performance single-seater, or a good two-seater that has a slightly less degree of performance. The Ford will fly two persons safely, but of course, at not such a high speed or rate of climb as when used in a single-seater. You cannot expect to install the Ford engine in a ship designed for a larger engine and get good results from it.

The engine will fly a large ship, but this is a dangerous practice for the reason that there is no reserve power for climbing and emergencies. It is always safer to build the special light ship and have a little power left over and above what is actually required to drive the ship along at a fair horizontal speed.

Now, the ships that we build for the Ford engine will weigh about 620 pounds empty. They will carry two 170 pound people with the engine throttle less than half open. We allow our engine to turn over at 1,750 r.p.m. on the ground and cruise at 1,650 in the air, although they will turn up to 1,900 r.p.m. in the air at full throttle in flight.

So even under these conditions there is some power left at 1,650 if you should need it and your engine will have a much longer life than if it is flown with wide open throttle. Cruising at 1,650 r.p.m. also reduces the amount of care

that is required for the engine and results in less repair work than when continually driven at full engine output.

With the single seater there is, of course, still more reserve power at cruising speed and a much higher top speed than is possible with the two-seater. This greater reserve power can be utilized for a higher top speed or for more rapid climbing, and where the field is small, the latter quality will be most appreciated. The cruising speed averages from 60 to 70 m.p.h. while the climb is very similar to the average OX-5 job. The service ceiling is about 10,000 feet.

In what is to follow, I will tell you how I rebuild the Ford "A" engine, but I will not advise you to follow any one method, for many of the operations depend entirely upon what sort of tools and equipment you have at hand and what experience you have had in machine work. I will tell you how I do it, and then if you think you can do it better some other way, or are compelled to make a change because of tool and shop limitations, then O. K.—so long as you achieve the same final results. This is not a course in machine shop practice, but an attempt at telling you what is to be done in order to get a successful converted Ford.

Most of you will have no tools or equipment at all, while certain others will have the use of a fully equipped machine shop with all the tools that they need, and under such conditions they will wish to turn out a de luxe job. This is just where the difficulty comes in when the subject of actual machine work arrives. Keep your eyes on the results to be obtained—and the method of obtaining them will be a secondary matter.

In making this conversion, there are a number of important changes that must be made. In the first place, the old ignition system, as originally supplied with the Ford engine, must be discarded, and an entirely new magneto ignition system must be installed. A battery system can be used, of course, but it is heavy and awkward and you have too much weight at the best.

Next, it will be absolutely necessary to change the lubrication or oiling system as the engine will not work at all with the lubrication system as it is. Then the cooling system must be improved to get the best results from the engine, and to avoid the use of an excessively large radiator. It all depends upon how well you make these changes, the service you will get from your engine. Proper lubrication and proper cooling are absolutely essential if the engine is to stand up against the terrific racket in flying.

While my plans show a 1930 type crankcase, you will find that there is much less work to do with the 1928 crankcase, as the small dams will not have to be put in with the 1928 crankcase. And as the pump can be taken out of the bottom, it will not be necessary to cut the timing gear cover

(*Continued on page* 395)

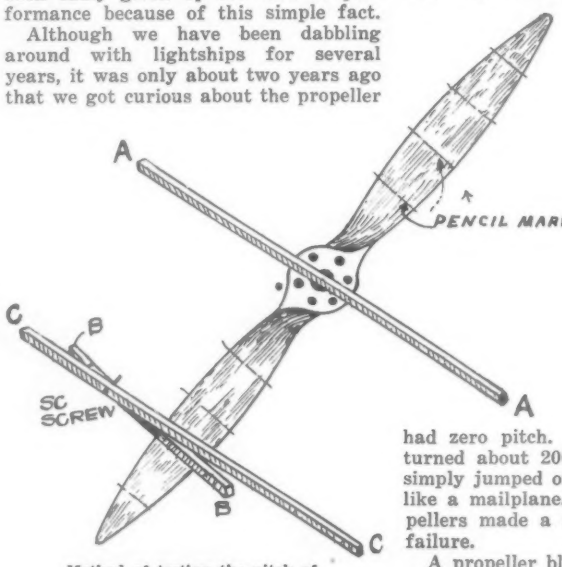
Propellers for the Lightplane

by LESLIE LONG

IT IS highly probable that very few of the lightplane crowd know how vital the propeller is to the success of the ship. To most of us a "prop" has always been just a "prop" —something that cost a little too much and was easy to damage. So long as it showed the right number of "revs" it must be O.K. The fact is that nothing could be much farther from the truth.

In the true lightplane we never have any power to waste. We must get everything out of the engine there is to be had and nothing can waste this power as easily as the propeller. For every combination of ship, engine and flying speed, there is just one ideal propeller. Many little ships have been sadly given up for lack of performance because of this simple fact.

Although we have been dabbling around with lightships for several years, it was only about two years ago that we got curious about the propeller



Method of testing the pitch of a propeller by means of straight edges.

end of the business. We learned a lot of things. One of the first lessons learned was that you can not buy a stock propeller and expect to get results, except on a stock ship and motor. If you do, it can only be by accident.

Even if we took two ships of equal weight and speed with identical engines, the same propeller would not be suitable for both, provided they were of different design in respect to the shape of fuselage and other details. The path of the slipstream around the cowling and through the various obstructions would be different and the performance would also be different.

IN GENERAL, it is safe to state that the larger the diameter of the propeller you can revolve, the better the results. This is a well known fact, but is especially true in the case of the lightship because of the comparative sizes of the fuselage and propeller. Often the diameter of the fuselage is practically as great as that of the propeller itself. Expecting a combination like this to show much performance is like lifting yourself over the hangar by your boot straps. It doesn't work so well.

In order to get away from this trouble, we must use as large a propeller as possible and we must design this propeller so that its effective work is done at the outer ends of the blades, whereby the slipstream is not interferred with after it passes back. This, of course, means that the pitch is much less at the inner ends of the blades than at the outer.

A recent experience will show how this acts. A friend had built a lightship which had a rather bulky fuselage. The engine was the well known Henderson. The propeller was 4 ft. 6 in. diameter by about 30 inch pitch. The best this combination could do was stalled hops of a few hundred feet in length.

For the fun of it, we fitted this job with a propeller of 5 ft. 1 in. diameter by 28 in. pitch. The blades were fairly wide and so shaped that at normal flying speed the inner halves of the blades had zero pitch. Although the engine turned about 200 r.p.m. less, the ship simply jumped off the ground and flew like a mailplane. The change of propellers made a success out of a total failure.

A propeller blade is simply a miniature airplane wing. Like the wing, there is a particular angle of attack at which it will do the most work for a given amount of power absorbed. On the average, this will be about 2 degrees positive angle.

If the propeller is so designed that at normal flying and engine speeds, this angle is maintained, you are getting the highest efficiency possible. This business of "pitch" is vital.

There are no absolute rules about it. Everyone knows that low pitch and large size means quick take-off and fast climb. In ordering your propeller for a lightship you can be fairly safe in specifying net pitch. That is, a pitch angle that will give the desired cruising speed without allowing for slip. The slip is taken care of by the thrust of the section at minus angles.

Let's say you wish to cruise at 60 m.p.h. You want to cruise your engine at 2,640. The pitch would be just 2 feet, because 2 times 2,640 makes 5,280, or one mile per minute. Just remem-

(*Continued on page* 393)

What Our Readers Are Building

A department devoted to our readers' activities in airplane, glider and engine construction, showing the latest developments in the amateur field.

Listen to This, Fellows!

THIS department has gone gliding along fine, fellows, for quite a long time. Everyone concerned has enjoyed it—to judge from the many letters that we have received. We think that this is a real department, read by go-getters in the field of aviation.

And always remember, bunch, that you are the real backbone and support of this column. If you failed to contribute, we'd have nothing to report. There's been some good dope in this department and there's going to be a whole lot more in time to come.

Now, we have had a lot of pictures come in lately, and we still have enough to fill about half the space for the next issue, but we'd like to be sure that we will have a sufficiency for the next time. So, please send your stuff in early and give the other fellow a treat. I know how hard it is to get around to this job, but—we need the stuff—and you've got it.

Here's an Amateur Engine Builder

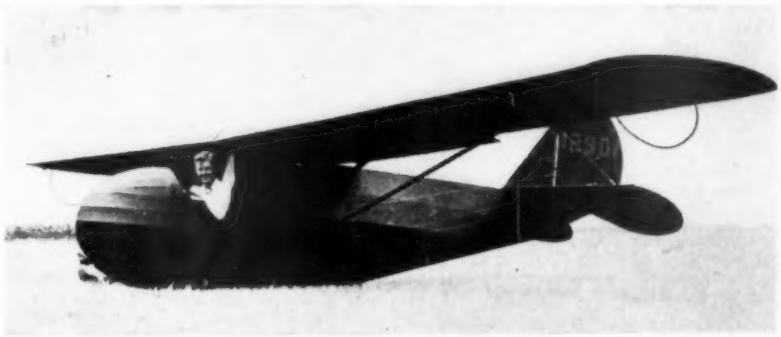
No one would suspect this engine of being an amateur job—it looks like a commercial factory job.

P. GLADCHENKO, 1901 Vallejo Street, San Farncisco, Cal., is specializing on lightplane engines and encloses a photograph of a light three-cylinder engine that he built.

He says that this engine cost $172.50 to finish. It develops about 40 h.p. and weighs 107 pounds. This is the fifth engine of this type that he has built in the past nine years. He promises to send us more data on this engine as soon as it has completed its flying tests.

The builder of this engine states that he is experimenting with a fuel injection type engine which he believes will be successful.

Finds Mead Challenger C3 Successful



This picture shows both the C3 glider and its builder, T. H. Steen.

THIS Mead C3 Challenger was finished August, 1932 by Theodore H. Steen, Chamberlain, So. Dak. It has a wing span of 38 feet and weighs about 220 pounds.

So far, he has made about ten towed flights with 300 feet of rope attached to a car, and has made every sort of take-off known to the science of gliding. He claims that it flies well in calm air which was impossible with the primary glider that preceded this ship.

He also says that as soon as he is able to make good 360 degree turns and spot landings, that he is going to soar the ship. The town of Chamberlain is located on the Missouri River and there are a great many ridges and hills from which good glider flights can be made. We will be anxiously waiting to hear about the flights.

This Heath is Equipped With Snowshoes

OUR old friend, John S. Gregory, Eastport, Mich., has reported to this column after a lapse of months. He used the Heath plans published in P.A. in 1930 and has just completed what was a very pleasant job of building.

He has equipped the Heath with skiis for use on the ice and snow, and is now going to start on a set of pontoons for next summer. Owing to the fact that there has been no snow or ice in his vicinity since the completion of the ship, he has not yet been able to test hop it, but promises to send us dope on its performance as soon as she slides off the snow into the air. Happy days.

Here is Gregory's Heath monoplane equipped with skis for winter flying. He expects to fit it with pontoons for over-water flying this summer.

Another Dream Ship

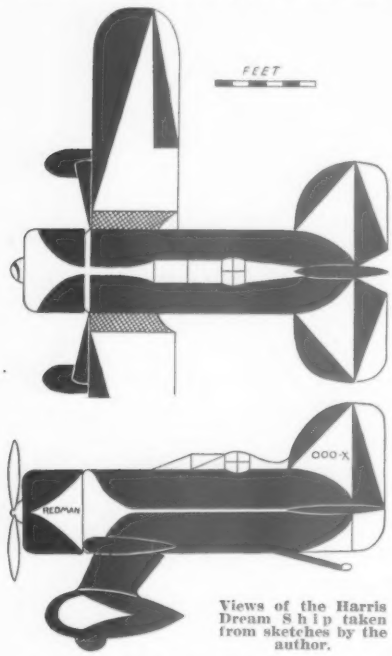
WILLIAM HARRIS, Guilford Manor Apartments, Baltimore, Md., has been seized with the designer's fever, and now passes his brainstorm over to us. This is what he has to say.

Most Gracious Editor:

In the August issue of P.A. you had a picture and a story about some Do-do's dream ship. Well, his ain't nothing compared with mine.

Three years ago, I got the terrible idea in a day dream on a Sunday morning about 11:15 A.M. in a large noisy church. Slowly but surely I worked, changing odds and ends and making all sorts of improvements.

Each time a major improvement was made, there would be two new models, one a flying scale model and the other a wind-tunnel model.



Views of the Harris Dream Ship taken from sketches by the author.

Models for the newest set of plans have just been completed and tested, and here are the specifications for the new Model "E."

SPECIFICATIONS

Span	32 ft., 0 in.
Overall length	23 ft., 0 in.
Height	11 ft., 0 in.

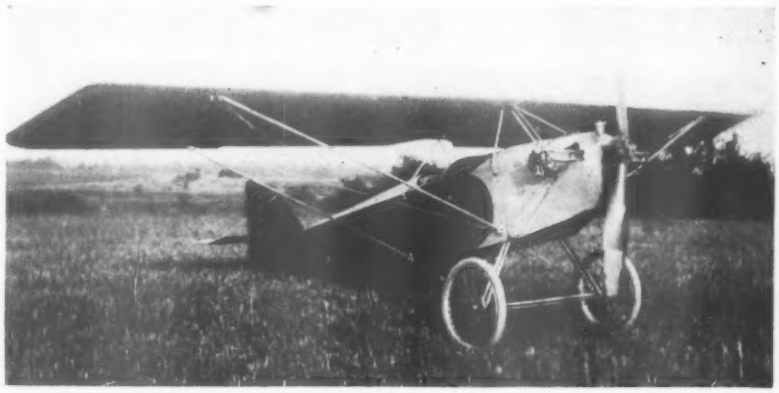
PERFORMANCE

Top Speed	208.32 m.p.h.
Cruising speed	185.00 m.p.h.
Landing speed	72.60 m.p.h.
Rate of climb	8,000 f.p.m.

The flying model's record was posted as a 22 second flight at an average speed of 42 m.p.h. I very generously offer permission to build one or two of these planes if the builder will kindly send me the performance dope.

Well, here is some originality at least, and it would be a mighty good thing if some of the fellows built models for their ships before stacking up the big one.

Here's an Old-Timer on the Job



Here is a venerable ship who did her stuff in the old days. With the exception of the wheels and landing gear, there is not a whole lot of difference between this and a modern lightplane.

HERE'S a lightplane that was started before Lindbergh's celebrated flight, and one that has shown good flying qualities. It was started in September, 1926, by Richard Short, Decatur, Alabama, who developed a bad case of flying fever at that time. It was given its initial flight on August 29, 1929.

Its owner-builder says that it has a quick take-off and slow landing speed, and that it has a very good degree of inherent stability due to the location of the wings. With power off, it will assume its normal gliding angle and almost land itself. He is planning to put the ship into production which certainly indicates satisfaction with the job.

SPECIFICATIONS

Span	31 ft., 0 in.
Chord	4 ft., 6 in.
Area, incl. ailerons	140 sq. ft.
Weight empty	395 lbs.
Weight loaded	575 lbs.
Wt. per H.P.	19 lbs.
Power Plant	Converted Lawrance 30 h.p.

PERFORMANCE

Take-off speed	30 m.p.h.
Landing speed	20-25 m.p.h.
Top speed	75-80 m.p.h.

This sounds mighty good, and should wake up some of the fellows who believe that the old-timers were dead ones. And, we almost forgot to say that he wishes to hear from anyone who is planning to build a lightplane.

The Mead "Rhon Ranger" Wins Its A.T.C.

IT IS announced by the Mead Gliders, Chicago, that their primary glider, the "Rhon Ranger," Model RR-1, has been awarded the U. S. Approved Type Certificate No. G-3.

This glider, shown by the accompanying photo, has a gliding angle of 10 to 1, and a stalling speed of 15 m.p.h. It has a span of 32 feet and a wing area of 165 square feet.

The Mead "Rhon Ranger," a primary trainer which has recently been awarded the Approved Type Certificate by the Department of Commerce. A good sturdy job.

POPULAR AVIATION FIRST INTERNATIONAL
MODEL AIRPLANE CONTEST

A few of the 81 prizes on display.

FELLOWS, the model contest is going over great! If you were here at the office you would be surprised to see how much interest is being displayed in this affair. Young and old, big, little and medium size modellists are entering daily.

Photographs are coming in briskly now, and this will no doubt continue with increasing volume up to the closing date, December 31, 1932. And there are all sorts of flying and non-flying scale models, some of which indicate excellent workmanship.

However, the entries in the flying stick and freak model divisions have been coming slowly, and again we wish to call your attention to the opportunities that exist in these divisions. The simplest sort of a flying-stick or the freakiest kind of a freak model might turn out to be a prize-winner.

Now, let us remind you, that your time is getting short, so get busy on that contest model, and send in the photograph without delay. Absolutely no entries will be considered that bear a postmark later than Dec. 31, 1932.

As we have told you in previous issues, this is a wide open contest for everyone. There are no entry fees—its free—and there are no age limits or limits of any kind. It is open to readers living in other countries as well as to our American readers and no favoritism will be shown in awarding the prizes.

You can enter one model or as many models as you wish in the contest, under any or all divisions. But please remember that you are first to send in the photograph of the model and NOT THE MODEL itself. After we examine the photographs we will call in the models that we wish to see.

For your convenience we have printed a coupon which you can clip out and paste on the back of the photograph, but this coupon is not absolutely necessary if you will write the same information plainly on the back of each photograph. We must, of course, know your name, address and the division in which your model is to be entered.

When you enter this contest you are competing for one of the 81 worthwhile prizes listed in previous issues of POPULAR AVIATION. Further, if you are a winner, you will have the distinction of being an international champion builder which is the height of distinction in the model world. The prizes are awarded on the basis of workmanship, faithfulness to detail and scale in the scale models, and the excellence of the design. There will be no flying contests of any kind.

Now we have been asked by several readers whether it will be necessary to follow the plans that have been appearing in POPULAR AVIATION. And the answer is "NO." You can use any standard plans that you wish, or the design can be entirely original with yourself.

And while we're talking matters over, why don't some of you compressed-air fans send us a photo of a compressed air model? The fact that we have not yet received any entries of this type prompts us to make a call for several good examples of this branch of the art.

Then, a number of readers have asked this question. "Can I use a kit-set for making my model or must I build it out of materials that I can find around the house?" Certainly, you can use kit-set material, strawberry boxes, laths or any other stuff that you can lay your hands on. We don't care how you build it as long as it is built. Even though we did raise a ruling against kit-set material, it would be pretty hard to enforce it because it would be almost impossible to distinguish this material.

Now, this contest is going to be a lot of fun for everybody, and we want you to get into the game with the rest of them. The more the merrier. But in order to get in, you'll have to step on it, for the time is getting shorter and shorter every day. Be sure to get your photograph into the office of POPULAR AVIATION before December 31.

For the benefit of new readers who have not had an opportunity of looking over the rules and regulations published in previous issues we will give a short review of the contest.

How to Enter the Model Contest

1. *Take one or more good photographs of your model or models.*
2. *Fill out the coupon, or a facsimile of same, giving name, address and classification under which you wish the model to be entered.*
3. *Paste a coupon, or facsimile, or write out the information on the back of each photograph and send them to POPULAR AVIATION, Model Contest, 608 S. Dearborn St., Chicago, Ill.*
4. *Please do not send a letter with the photos, nor ask us questions as to the progress of the contest. All such information will be found in succeeding issues of POPULAR AVIATION.*
5. *THIS CONTEST CLOSES DECEMBER 31, 1932.*
6. *As soon after Dec. 31, 1932 as possible, the 81 winning contestants will be asked to ship their finished model to Chicago where a group of expert judges will decide prize winners by a personal examination of the actual models.*

This contest, be it understood, is for the purpose of developing interest in the design and workmanship factor in model building. The better the model is made—the higher will be your rating in the contest. We don't care how the model flies, and there will be no flying contests.

First build your model. Next take a good clear photograph of the model, and send this photograph to us for our examination. Paste the entry blank on the back of the photograph, or what is the same thing, write the information called for by the blank, on the back of the photo. Then mail the photo to us, and wait until you hear from us. But don't send the model until we ask for it.

When we examine these photos, we will send for the models that interest us most, and then determine the winners from these models.

And so fellows, here's your last warnin—get 'em out right away and get them out quick — snap to it — before December 31st.

The following information must appear complete on the back of every model photograph submitted in this contest. This entry blank is printed for your convenience to paste on the back of photographs, but is not required so long as the information is filled out on the back of each photograph.

POPULAR AVIATION FIRST INTERNATIONAL
MODEL AIRPLANE CONTEST
608 South Dearborn St. **Chicago, Ill.**

Please enter this photograph in the division checked:
Flying ☐ Non-Flying ☐ Stick ☐ Freak Design ☐

Name .....

Street or R. F. D. .....

City ..... *State* .....

New Ideas for Our Model Builders

Hints, kinks and new model flying stunts gathered from far and near for our model builders

How to Launch a Model

FOR those who have not built any indoor models, or have not flown models before, it is best to build a simple small indoor tractor type from some successful beginner's tractor model drawing. When you have built the model, find a suitable place for flying it and follow the information given below to get the best duration out of your model.

The actual flying of an indoor tractor model is a good deal easier than flying an outdoor tractor type, for you always have ideal air conditions indoors instead of the varying weather conditions found-out-of-doors. Before flying the model, be sure that it is assembled properly, and that you glide it several times first.

In gliding the model, hold it by the motorbase in your right hand over your head just back of the wing, and launch on a slight downward angle with a gentle forward push. If the glide is too steep, the model has insufficient elevation. To remedy this move the wing forward a little and glide it again.

If model stalls while trying to glide, it is over elevated and can be adjusted by moving the wing a little to the rear. If model glide is five or six times the height you hold the model above the floor when launching it, you are ready for a trial flight. A tractor model which has a slight negative angle in the tail helps maintain longitudinal control while gliding or while in a power flight.

For the trial flight, wind up rubber motor about 500 turns with an egg-beater winder. Before winding, be sure that you have someone to hold your propeller and that the rubber motor passes through the "can" or "cans" of the motor base. Also be sure that you wind carefully so that the propeller will have the proper power and turn in the right direction when released for flight.

Before winding, stretch the rubber about three times the original length, and while winding the rubber, walk in toward model until you have 500 turns and are near to the hook of the motor-base. Unhook rubber from winder and attach motor to the hook. See that the wing adjustment is all right, and last be sure that it is well secured to the motor-base.

In launching, hold the model by the motor-base (a little to the rear of the wing) in your right-hand. With the

(*Continued on page* 390)

A Beautiful Scale Model of the F6C-2

A front view of the beautiful F6C-2 model built by Mr. Harris. Note the beautiful finish and careful workmanship.

HERE we have an elaborate and beautiful non-flying scale model submitted by Mr. B. F. Harris, Chicago. It is perfect in the smallest details and is accurately to scale.

Now, before any of you prospective contest entrants get scared to death, Mr. Harris has told us that he does not wish to enter the contest for a prize. He simply wishes to show what a business man can do after office hours—working on his dining-room table. No, he is not a contestant.

This model of the Curtiss Navy Akron Fighter, F6C-2, has a 24-inch wing span and was built from the original ship. It has a completely equipped cockpit, an illuminated instrument board, leather lined cockpit, full stick control with movable surfaces and a safety belt.

An electric motor for driving the propeller adds the last stage of realism to the little ship and hinged aluminum patch plates are provided for inspecting the motor brushes.

The photograph gives only a faint idea of the excellence of the finish for it is polished and rubbed down to the fineness of the fuzz on a bee's knees. All of the fittings are true to nature, and altogether it is a marvel. If the writer remembers correctly, Mr. Harris took the trouble to examine the actual and original ship itself before finishing the job.

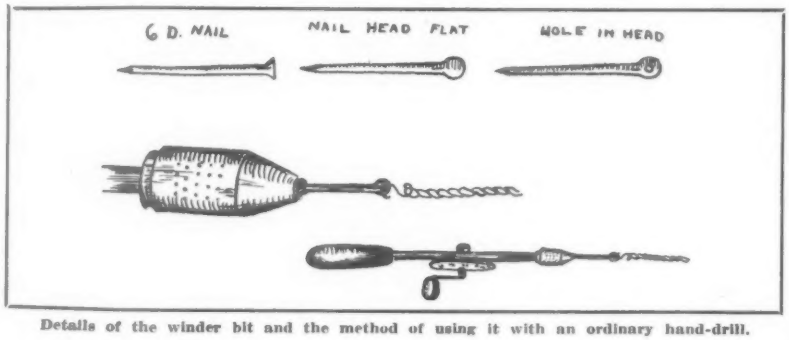
Here is a New Idea for a Winder

NOW, Mr. X, of X-ville, you see he forgot to sign his name, has devised a scheme for a rubber winder, or rather, the bit for a rubber winder.

He evidently got tired of mother's eggbeaters and appropriated his father's hand-drill. Anyhow, it is a neat little idea for those who have spare hand-drills laying around the house.

To make this bit, you first locate a 6-penny (6D) nail. You can then take a hammer and pound the head down flat, or else lay the head of the nail on the street car track. It's all the same. The third operation calls for drilling a small hole through the flattened head. And then you're through.

Next, put the nail in the chuck of a hand-drill, put the outer end of the "S" hook into the hole drilled in the nail head, and wind away to your heart's content.



Details of the winder bit and the method of using it with an ordinary hand-drill.

Here Are Some Lineups

Here is the lineup of the German air-force.

ARNOLD SMITH, 2887 Beechwood Blvd., Pittsburgh, Pa., has a yen for wartime models—either Allied or German—and these models are all well built and true to life.

The first lineup, which is quite realistic, shows an Albatros D-V and a Fokker D-7 with an appropriate background.

The Allied lineup consists of a Spad 9, and a Nieuport 28, both excellent models.

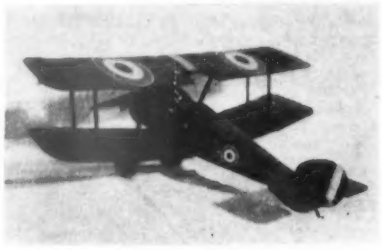
An Allied lineup.

A Big Compressed Air Model

Testing out the C. A. model.

HUGHES HOBART is shown testing out the motor on his six-foot compressed-air model. As no letter accompanied this photo, we can give you no information as to the outcome of the test. Maybe he'll write in and tell us.

A Well Made "Camel"



Natural as life is this Camel.

JAMES ROGERS, Cleveland, Ohio, contributes this picture of a "Camel" model that is attractive.

He Cleans 'Em

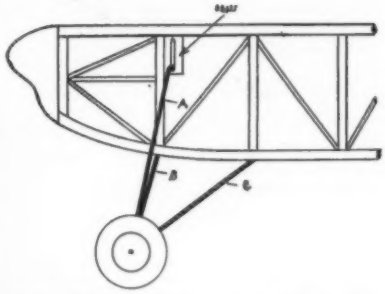
FRANK H. McLAUGHLIN, 5238 Nottingham ave., St. Louis, writes: *I am enclosing a hint which may prove useful to builders of scale model airplanes. Most scale models cannot be protected from dust and dirt and soon get so dirty that their decorative value dwindles.*

Because of the many fragile small parts and wires they cannot be cleaned with a dust rag. Recently I faced the task of cleaning a model of a Curtiss Condor and this is how I did it.

I removed the nozzle from the garden hose and fastened it to a faucet. Then I turned the nozzle so that it threw a very fine spray on one side only (the next position to off) and by holding the model in the spray it was washed clean without damage.

The hose nozzle is necessary for a thin stream of considerable pressure is needed to wash off the dirt and water direct from a faucet has not the required pressure.

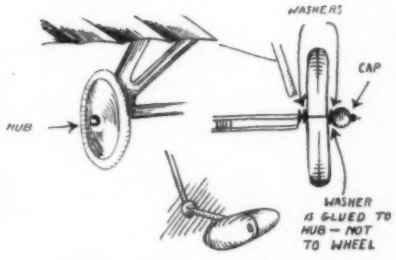
A Good Landing Gear



A NOVEL idea for a landing gear has been submitted by Elbert J. Weathers, 2265 Pelham Ave., Los Angeles, Calif.

The shock of landing is absorbed by the strut (A) when pushed up along the slot in the brass plate mounted below the top longeron. The strut (A) is of piano wire, bent at right angles to the brass so that it cannot slide through the slot sideways.

Another Capsule Stunt



Well, here are some more capsules.

HERE are some more capsule stunts left over from last month that are of interest and profit.

An English Model

Launching the English biplane model.

IF you wonder what they are building abroad in the way of models, then this picture will at least partly satisfy your curiosity.

Mr. Lome, an English model builder, shows his flying scale model which is said to put up an excellent performance and which shows up in the photo as a fine clean-cut job.

It has the surprising weight of 17 ounces. This, to Americans, is an almost prohibitive weight, but as English readers have told us, it is difficult or impossible to get balsa in England.

Just Like a Real "Tripe"

We wish that Richthofen could see this.

AT first glance, you can't tell whether this is a real battle scene with a Fokker triplane in action or whether it is only a model.

Manley Mills, the builder of the model, says that it is built to a ¾-inch scale and weighs about two ounces. He says that it is a very steady flyer, making flights of several hundred feet at a good altitude.

Student Flyer Builds Model

A nice model of the "Orion."

OUR old friend, William Ishii, Student Pilot No. 11-9884, sends us a photo of this nifty little Lockheed.

XUM

Building the Simple "Pusher-Puller"

by POP STICK

Here's a design of a simple yet excellent flying-stick model that shows good performance. As there is now a shortage of stick-model entries in the P.A. contest, this model is suggested for those who have not made any definite plans.

AN ENTIRELY different and unique model—a type that has not received a great deal of publicity, though it makes a good and consistent flyer is the Pusher Puller presented here.

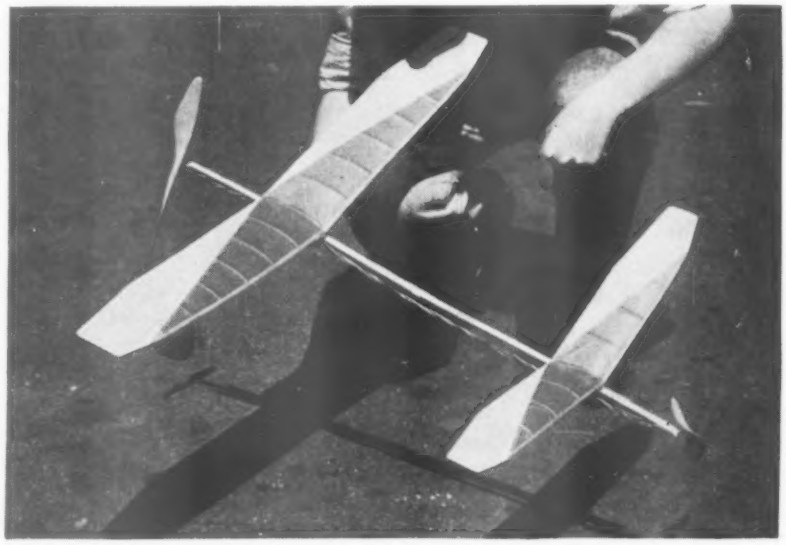
At various contests that I have attended as judge, models of this type have appeared among the contestants, but with varied results. The flights that were secured were short and in most cases entirely unsatisfactory as the duration was less than the time that would qualify the entrant up to his first ten seconds.

The first ten seconds in a contest is a period of time given the contestant before the model is classified as having stayed up long enough to constitute one official flight.

The construction of this pusher puller is so simple that it can be built in one day and the best possible duration that can be obtained under ordinary conditions is ninety to one hundred twenty seconds. The body is a motor stick with a can in the middle and two sets of bearings—one at each end and on opposite sides. The elevator, which is also the front wing and is classified as a "stabilizer," is exceptionally large and has a dihedral of approximately three inches.

The front wing is cemented securely to the frame, having an angle of incidence of one-quarter of an inch. The large wing, which has a span equal to the motor stick length, is held in place by wing clips, both of the same size so that the wing is set at a zero angle of attack.

Launching the Pusher-Puller.



Here is the original Pusher-Puller that showed such excellent performance.

Motor Stick

THE motor stick in itself is very simple and the top plan view of the drawing clearly illustrates how the thrust bearings and wire fittings are attached. Note in particular that the length of the rubber motor is kept the same by adding an "S" hook to the propeller shaft at the front end.

The "S" hook has a curve like the letter "S" at the small end, where it meets the shaft, so that the twisting will not tend to throw the "S" hook back against the large part of the shaft and prevent it from revolving. The cans or anti-buckling eyes may be continuous as the rubber is passed through them and it is not necessary to remove them for winding.

Elevator Construction

BOTH wings on this model are single surfaced or covered in the top side only. Wings covered in this way, with a deep wing section, make the model fly slow and on very little power, so that high pitched propellers, revolving slowly, help to increase the duration of flight. The gliding angle is also increased, especially after the model has reached a little altitude where it reaches the upper currents.

The leading edge also acts as the front spar and the trailing edge as the rear spar. The front spar is rounded off and the rear spar is a continuation of the rib to a sharp edge. The dihedral in the front wing is three inches for each side. The covering is two toned red and white. Refer to the photographs for the combination employed.

Main Wing Construction

THE large wing is similar to the elevator. The leading and trailing edge act as spars, being held together by the ribs. The additional pieces that complete the wing tip are cut down and reduced in size, but the width is the same.

A two inch dihedral is used on the large wing. The color scheme is similar to the elevator. The clips should be secured firmly and tied with thin silk thread before attaching the covering. A single surfaced wing may be warped readily at all times so that proper "wash-in" or "wash-out" can be added to make the model fly on a true course.

Rudder Details

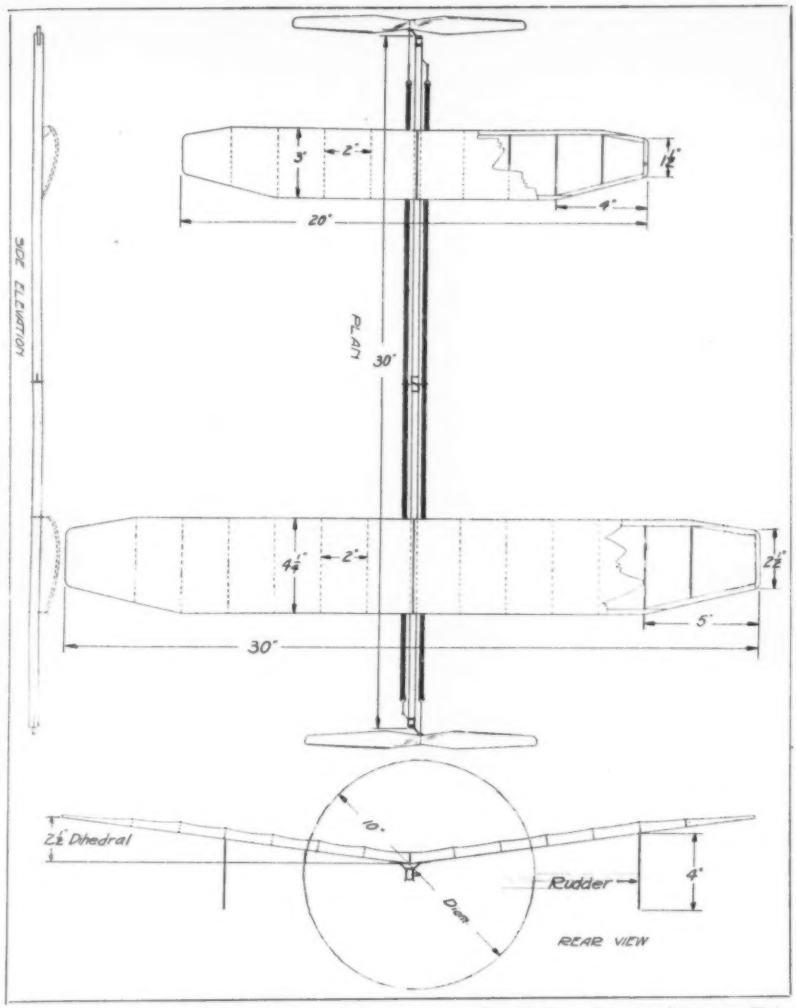
THE rear propeller tends to make a model of this type go into a nose spin and to counteract this tendency two small rudders, built up of bent bamboo, are attached to the under side of the main wing. The location of these is clearly shown in the rear view.

The bamboo is bent and fastened to the front and rear spars being cemented securely in place. Red tissue paper is used for covering and is applied on one side only.

The Propellers

THE propellers are carved in the conventional way and there is not much choice left as to the direction of rotation. If the shafts are put in so

(*See next page*)



This is the plan of the Pusher-Puller flying-stick model described on the opposite page. Note the heavy "dihedral" wing angle in the front view that contributes stability to the flight.

that they turn in opposite directions, a double winder may be used attaching at the front end. The difference in the torque may be adjusted by warping the main wing. If the propellers turn in the same direction each strand must be wound up separately so they will unwind together, in the same direction.

The flight duration depends upon a number of factors, but mostly upon the propellers and the rubber motor. The exact pitch of the propeller can only be determined by experimenting with two or more spare propellers, for no rule can be given that will fit all cases. It is a matter of cut and try until the best results are obtained.

The rudders indicated in the plan are surfaces located near the tips of the main wing, and this arrangement can best be seen in the photographs of the model.

Materials Required

Motor stick	firm balsa	3/16 x ⅜ x 30"	1
Propeller blocks	firm balsa	⅞ x 1 x 10"	2
Thrust bearings	steel	medium	3
Propeller shaft	piano wire	.029 diameter	2
Rear hook	piano wire	.029 diameter	2
"S" hook	piano wire	.029 diameter	2
Can	piano wire	.029 diameter	2
Rubber motor	rubber	1/32 x ⅛ x 15 ft.	2
Spars	balsa	⅛ x ¼ x 30"	2
Spars	balsa	⅛ x 3/16 x 24"	2
Rib stock	balsa	1/16 x 2½ x 24"	1
Tissue	Hakone, white	20½ x 24"	1
Tissue	Hakone, red	20½ x 24"	1
Rudders	bamboo	1/16 x ¼ x 12"	1
Cement	clear	large tube	1
Washers	brass	⅛" O.D.	6

BARTER AND EXCHANGE

If you have anything that you wish to trade or buy, just send your wants to POPULAR AVIATION, Barter and Exchange Department, 608 S. Dearborn St., Chicago, Ill. This service is FREE to our readers, but the publishers reserve the right to reject any and all notices of an objectionable nature.

The publishers assume no responsibility for these trades, and for your own protection make certain that you are dealing with an honest and responsible person.

CORRESPONDENCE COURSE and a Set of Modern Aviation Engines to trade for a lightplane engine worth about $35. The propeller must be included with the engine and the engine must be in good running order. Henry Plante, Chisholm, Me.

MEAD CHALLENGER GLIDER, only four months old, with streamline struts and trailer. Will exchange for a 1930 or 1931 motorcycle. David Schenfeld, 820 Gravesend Ave., Brooklyn, N. Y.

LIGHTPLANE to exchange for a 1931 Ford or Chevvy sedan, or similar car. James Scimont, 30 N. Portland Ave., Brooklyn, N. Y.

PHOTOS TO EXCHANGE. I would like to exchange for photos of modern planes. Interested in contacting fellows near the Boeing, Curtiss, Keystone, Berliner-Joyce and Consolidated Aircraft factories. Kipp Cooper, 337 N. Croft, Hollywood, Calif.

1928 FORD "A" Roadster in good shape. I will trade this car for a lightplane. —Lester Corning, Colby, Kan.

MODELS to exchange. Have a number of scale non-flying models that I will exchange for warplane photos, flying models or what have you? The wing span of my models run from 18" to 30". —Chas. Underwood, 6227 Byron St., Chicago, Ill.

CORRESPONDENCE COURSE in Aeronautics. What have you to offer for this course, trade or cash?—Frank Baumstark, Box 313, Glen Ullin, N. D.

COMPRESSED AIR MOTOR for large airplane model to trade for lightplane parts, airplane instruments or what have you.—Geo. Sickles, 6227 Byron St., Chicago, Ill.

LIGHTPLANE ENGINE WANTED. I have a lightplane but no engine. Will go into partnership with anyone having a 30 h. p. to 40 h. p. engine for this ship. —Fred Quick, 408 S. McClun St., Bloomington, Ill.

PHOTOS of 1931-1932 National Air Races to trade. All types of planes, Foreign, Army, Navy, Commercial and racers. Most of the pictures are 116 size with a few No. 120.—John J. Morrison, 115 Bruce St., McKees Rocks, Pa.

MODERN PLANE PHOTOS to trade.—Bud Riegert, 2009 Cherokee St., St. Louis, Mo.

PHOTOS of modern planes and famous pilots to swap.—Al Bachmann, 410 West Ferry St., Buffalo, N. Y.

PHOTOS TO TRADE—Have a collection of 1,068 different pictures and many duplicates which I would like to sell or trade to members of the club. Interested in any kind of aircraft photographs.—Letcher Bailey, 3833 Stratford Ave., Dallas, Texas.

MODEL PLANS to trade. I have good plans of nine different flying model planes that I would like to trade for pictures of modern speed planes. I also want plan of DO-X.—Robert G. Leonard, 7208 Sommers Road, Philadelphia, Pa.

AIR VIEWS desired, or snapshots taken from an airplane.—A. R. Richards, Box 92, St. Gregoire Co., Nicolet, Quebec, Canada.

PHOTOS Swapped. I am making up an album and wish to get more airplane pictures.—Jacob Shapiro, 2574 East 59th St., Cleveland, Ohio.

AIRPLANE PICTURES WANTED, any kind. Send prices.—Alfred Hoekstra, Jr., Box 156, Roselle, Ill.

XUM

Building the Polish "PZL-6" Fighter

by JOSEPH S. OTT

This model of the well known "PZL-6" is an interesting subject, for it not only flies well but also makes a very neat appearing job—a true copy of the original ship that aroused so much comment at the air-meets.

AFTER receiving numerous requests for war planes of foreign countries, the Model Department decided on the new Polish "PZL-6".

We are always very glad to hear what the model builders would like to have and we want them to know that we appreciate all comments even though we cannot answer them individually.

The Bellanca appearing in the November issue is a type easily constructed in regard to both the wing and the body. The body is rather deep but at the same time a square section with only a small portion rounded at the nose. The wing of the Bellanca was easy to construct as all the ribs are of the same depth and length.

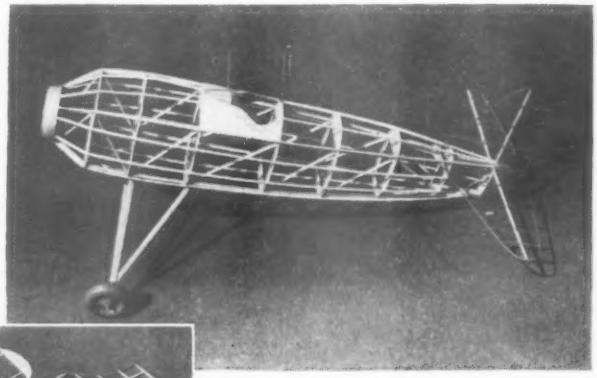
However, this month's model is a little more difficult because of the circular type body and the tapered wing. Besides being tapered, there is an extra large section cut away over the pilot's seat which shortens and thins the ribs at the center. The deepest and longest rib is approximately half way out from the center of the body. As few ribs as possible were used to help make the construction of this model simple.

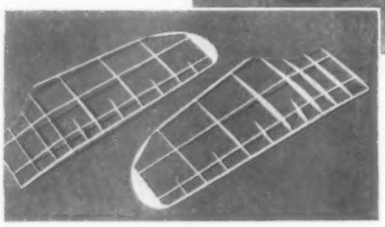
Note in particular, the position of the wing and how close it comes to the nose of the model. To maintain the scale proportion the given wing position is correct and the model must be balanced by adding weight to the nose. This may be accomplished by leaving the propeller thicker and heavier and adding on an entire dummy motor including an aluminum cowl.

All ready to fly—a fine looking model and a good performer.

At the right is the completed fuselage and landing gear structure which is a decidedly neat job. It seems a pity to cover it over.

Below are the wing frames having the peculiarly formed ribs described in the article. Note the sub-ribs at the leading edge of the wing.





The model has quite a large wing area and the additional weight of the motor and thick propeller should not cause the model to weigh more than two and three-quarter to three and one-quarter ounces, which should not be considered a very heavy model.

Wing Construction

The wing is built in two separate halves, one left and one right. The small dihedral helps to give the gull wing effect in addition to cracking the spars at the fourth rib. Both wings should be checked carefully so that an equal amount of gull effect is in both.

Note that No. 1 rib is very low in height; No. 2 a trifle higher, and the height of each rib is a little more up to No. 5. Then the height decreases until the wing tip is reached. It is best to make a full size of No. 5, which is the longest and the deepest. The nose ribs were added to help maintain the correct curve at the leading edge.

In laying out the ribs, remember that the leading edge is not straight. The tip extends back approximately a quarter of an inch on the 15-inch model and a half inch on the 30-inch model. Both halves of the wing are cemented against the center fairing strip of the body so that the wing has a correct angle of incidence approximately one-eighth of an inch.

To accomplish this, the body at the leading edge is lower and must be filled in with balsa which should extend high

(*Continued on page* 384)

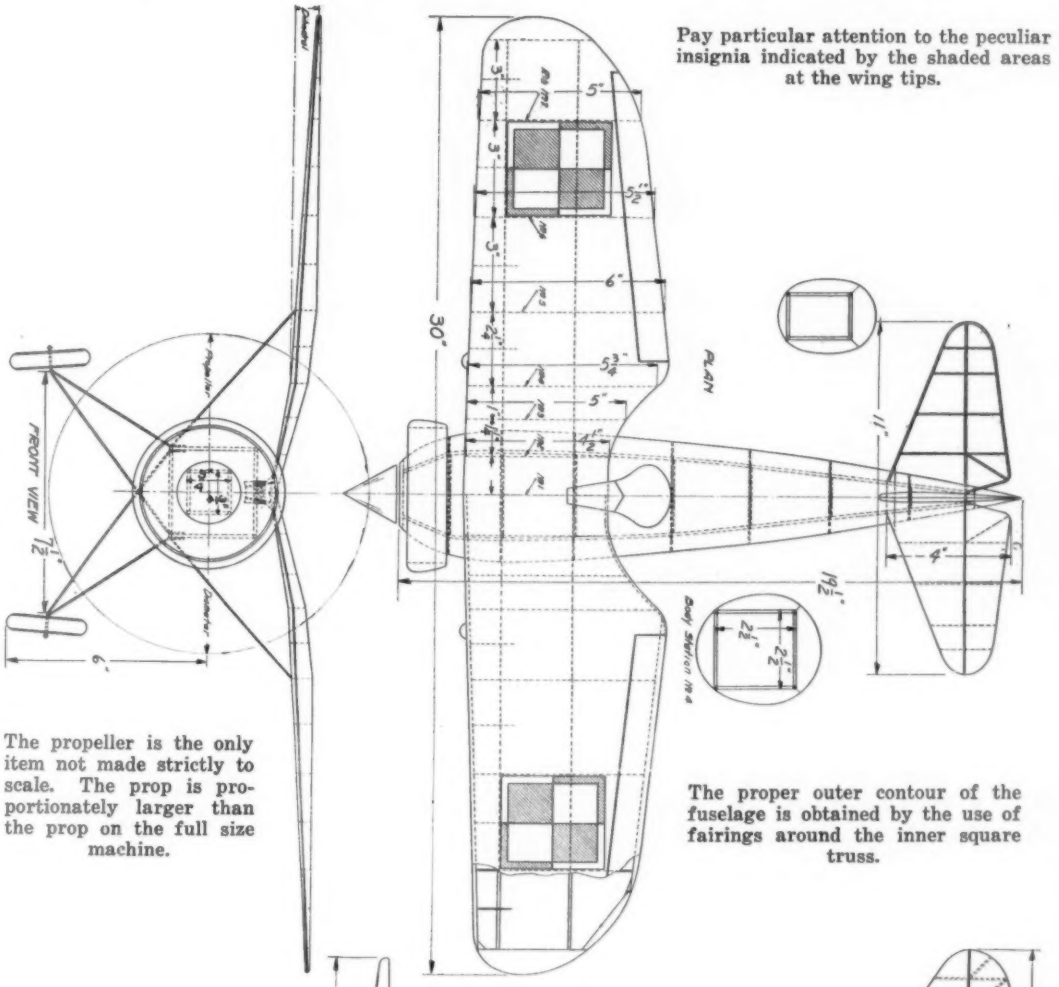
MATERIALS REQUIRED

Nose Block—2" diameter x ½"	1
Propeller—⅞"x1"x10"	1
Longerons—3/32"x3/32"x24"	10
Bulkhead—1/32"x2"x24"	2
Fairing Strips—1/16"x3/32"x24"	15
Struts—⅛"x⅜"x12"	4
Spars—1/16"x⅛"x24"	4
Leading Edge—⅛"x3/16"x24"	2
Trailing Edge—1/16"x¼"x24"	2
Rib Stock—1/16"x2"x24"	2
Tail Units—1/16"x¼"x12"—Bamboo	5
Landing Gear—1/16"x¼"x12"—Bamboo	2
Motor—1/32"x⅛"x60"—Rubber	1
Wheels—2" diameter	2
Washers—⅛" diameter—Brass	3
Shaft—.024" diameter x 3"	1
Tissue—Red—20½"x24½"	1
Tissue—White—20½"x24½"	2
Tissue—Black—1"x20½"	1
Cement—Large Tube	1
Dope—Large Jar	1
Lacquer—Small Jar—Green	1

The Polish "PZL-6" Fighter

A Flying Scale Model

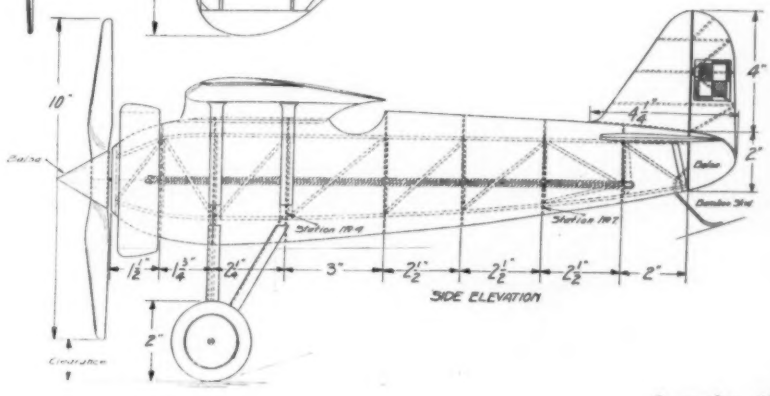
A novel type of a very recent European speed production that shows excellent performance both as a large machine and in the form of a scale model.



Pay particular attention to the peculiar insignia indicated by the shaded areas at the wing tips.

The propeller is the only item not made strictly to scale. The prop is proportionately larger than the prop on the full size machine.

The proper outer contour of the fuselage is obtained by the use of fairings around the inner square truss.



Note how the rib form, the wing thickness and section wash out toward the wing tips. For the rib details, see next page.

"PZL-6" Fighter

(*Continued from page* 382)

enough so that the complete depth of No. 1 rib will cement directly against the side. No bamboo is used on the tip and care should be taken so that the thin balsa will not warp out of shape when applying the tissue and shrinking it.

Body Construction

Before starting on the fuselage, refer to the side elevation and note that the entire fuselage is built around a square framework. To this square framework are added the bulkhead formers of 1/32-inch balsa. These in turn are held in place by the longitudinal fairing strips which complete and maintain the circular form of the body to which the tissue is cemented. The rubber motor is attached to a cross member which rests against the uprights at station No. 8. The tail end of the fuselage is a solid piece of light balsa hollowed, conforming to the shape illustrated.

Landing Gear

The landing gear is built of balsa and reinforced with bamboo leading edges. The bamboo continues and rests against the upright body formers. The axle may be a continuation of the bamboo part or a wire piece may be tied and cemented at the "V" joint of the lower part of the landing gear. A continued piece of bamboo is the simplest method.

The tail skid is a small piece of bamboo approximately one-sixteenth of an inch square cemented in position as illustrated.

Tail Units

The entire rudder and stabilizer are built of bamboo. The outline is bent bamboo shaped to the required form. The spars are balsa, 1/16" x 1/8". Each rib is made of two small bamboo splints. The rudder is built on top of the center fairing strip which continues to the tail post.

The stabilizer rests on the top longerons. Be sure to keep the stabilizer in a neutral position. Lower or raise at the leading edge and fill with a small piece of balsa if necessary.

Propeller

As illustrated in the drawing and photograph the propeller is sunk into a tapered nose piece. This finishes off the appearance of the model and gives a completeness characteristic of military planes, at the same time denoting speed and power.

Covering

The color scheme illustrated in the photographs may be followed and dope or banana oil used to cement the tissue to the framework. It is not necessary to dope the entire wing or body as this tends to draw the tissue very strongly and distorts the framework. Spray the entire covered model lightly with water and allow it to dry. The shrinkage that will take place will be sufficient to draw up and tighten the tissue on the entire model.

Attention should be paid to the distinctive Polish insignia or emblem placed near the wing tips. This consists of a large square divided into four smaller squares as indicated on the plan drawing. This insignia, of course, should be drawn on the wing covering while the sheet is flat and before it is attached to the wing. A smaller insignia of the same design is attached to the rudder.

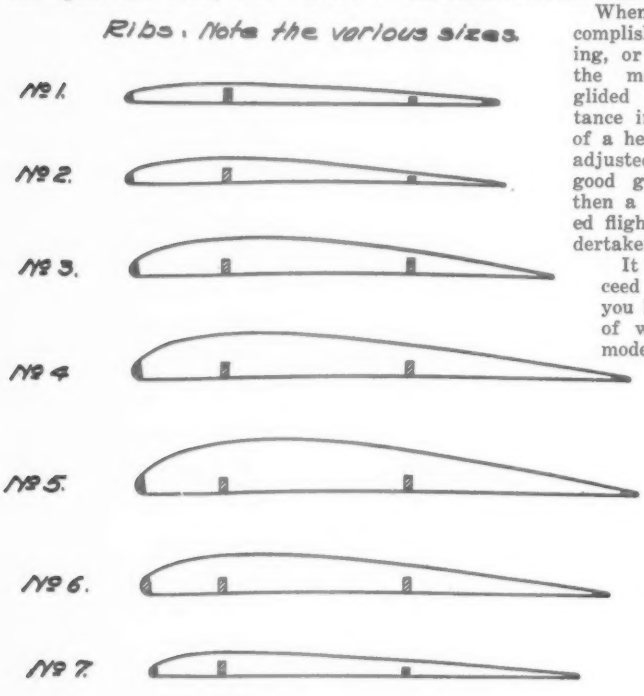
Flying the Model

Before an attempt is made at flying it should be carefully balanced by hand so that its center of weight or balancing point lies approximately one-third the chord from the leading edge.

When this is accomplished by weighting, or other means, the model can be glided a short distance into the hands of a helper. When so adjusted that it shows good gliding ability, then a short "powered flight" can be undertaken.

It is best to proceed carefully, for you have put a lot of work into this model and it would be a shame to crash it before you have had a few good flights.

END



The wing section is tapered, hence the height and shape of each rib is different at the various stations or distances from the center.

Airy Chat

(*Continued from page* 346)

tain is turning out super-ships of every type, France is building them so fast that Tuesday's model is out of date on Wednesday.

If they are accomplishing nothing else they are having a lot of fun, and it keeps the photographers out of mischief taking shots of each new marvel as it takes to the air. Wonder where this European aircraft competition is going to end?

* * *

THERE'S one of our readers, at least, who has solved the lightplane license problem. He lives out on a ranch where there is plenty of room to fly without going outside of the fence line. And when he flies over his own property they can't grab him. Gee, it's great to be lucky!

* * *

OF LATE, we have had a whole lot of letters concerning the standing of the commercial pilot in society. Some claim, and rightfully, that a commercial pilot is a professional man, standing in the same class with lawyers, doctors, engineers and architects. Mr. James Ellis, New London, Conn., has favored us with his views on the subject that have the touch of authority. Here you are.

A transport pilot puts in long hours of study on subjects that are taught in colleges and universities. He is in constant and intimate contact with all of the latest scientific developments in electricity, mechanics, radio, navigation, meteorology, and kindred branches. He is never through learning or studying.

For this reason, he should be rated as a professional man, not simply as a man working at a routine trade. He must have high ideals and a love for his occupation and in most cases is not influenced by money alone. He must be resourceful in the face of danger or unusual conditions and must be able to figure out each new problem when it is presented to him. He is not altogether guided by precedent but must have a clear, active brain that is capable of thinking on its own account without reference to others.

In many branches of aviation, he performs the functions of a mechanical or structural engineer, inspects complicated structures for strength and endurance. He must understand the underlying theory of flight and is not merely a driver or operator in the sense of a chauffeur or truck driver.

This, I believe, covers most of the argument in a nutshell. After many years of contact with pilots, we believe and know that the commercial pilot is really a professional man with a professional attitude toward his occupation, and without exception is a deep student of things scientific.

* * *

IT HAS come to be a standard belief that aviation is for the young man alone and is taboo for the old guy of

some forty years or more. Belonging to the latter class I take issue with this belief even though I am defying the esteemed Department of Commerce by so doing.

I believe that all age limits and all such petty discriminations should be abolished. This flying business is not a purely physical performance, and in most cases calls for a certain percentage of the stability and stolidity that comes with age.

And in saying this I am not at all opposed to the idea of youth—far from it. Let them enter aviation as young as they will and stay with it as old as they may become. Why raise a distinction where no distinction should exist?

* * *

JUST at this point we wish to introduce a correction made by Lee Eyerly in respect to the description of the Eyerly trainer described last month. He says, and proves with a photograph, that his trainer does have three planes of motion so that lateral control can be had, just as in a real airplane. The photograph sent to us in his letter shows that the fuselage can turn sidewise in the trunnion ring, a fact which was not indicated by the previous photos submitted to the author. Thanks for the correction.

* * *

AND this reminds us that we have two more entries in the ground trainer class which brings the total number up to fifteen or sixteen machines of this type.

* * *

ALL of our readers will welcome General William Mitchell and his article in this month's issue of POPULAR AVIATION. He speaks authoritatively of conditions in the Army and the Navy which have been condemned by other authors and investigators in previous issues of this magazine.

It is not our purpose to idly pick flaws in our air service without cause—if the deficiency exists it should be exposed and held open for the public to see.

Our articles treating of the shortcomings of our air service are not simply fault-finding articles—they are published as a warning to those who have the interests of this country at heart. Read this amazing exposure by General Mitchell—it is not only interesting but instructive from many viewpoints.

* * *

FUNNY thing, this airplane business. The airplane is now 30 years old, and is still as far from its objective as ever. By this time it should be one of our leading industries instead of being in about the 1,000 place.

Thirty years of airplane peddling have taught the airplane builders less than nothing. In their anxiety to sell $500 worth of airplane for $3,000, they have overlooked most of the good bets. There is nothing about an airplane that justifies the present prices.

Then, to cap the climax, they enlist

(*Continued on page* 388)

What a MERRY CHRISTMAS *these* SCIENTIFIC KITS *will bring!*

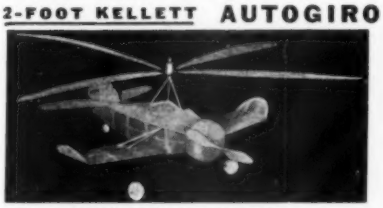
They are gifts that the beginner as well as the more experienced model builder will welcome and enjoy, because of their quality and perfection.

Now Comes Major Doolittle's "FLYING SILO" the New Record-Breaking

TRI-MOTORED STINSON AIRLINER

Every boy can well afford to buy a Stinson Airliner. And just look at these specifications—Wing Span, 26¼"; Length, 17½"; Weight, 1 oz. Here's what this Kit includes: All balsa clearly printed; 3 finished, turned balsa cowlings; finished balsa wheels with bushings; Ready-shaped propeller; all wire fittings ready formed; all insignia and letters cut out and gummed; banana oil; colorless cement; colored dopes; fine tissue; bamboo; rubber motor, and balsa strips cut to size. Colors, Dark Green and White. Complete Full size plans and instructions..... **1.50 Post Paid**

2-FOOT KELLETT AUTOGIRO



An honest-to-goodness gift, or contest entry. Works on the same principle as the original ship. Will fly from 200 to 500 feet and what a genuine thrill it provides. Complete with everything (all ribs, wingtips, bulkheads, etc., stamped on sheet balsa). Full size plans and instructions. **1.50 Post Paid**

Model Supplies at World's Lowest Prices

36" Scientific Balsa
1/16 x 1/2...8 for 5c
1/16 x 1/8...7 for 5c
1/16 x 1/4...6 for 5c
1/8 x 1/8...6 for 5c
1/8 x 1/4...6 for 10c
1/4 x 3/4...6 for 15c

36" Sheet Balsa
1/16 x 2.....4c
1/16 x 3.....8c
1/8 x 2.....5c
1/8 x 3.....9c
1/4 x 2.....6c
1/4 x 2.....10c

Prop. Blocks
3/4x1 1/2x5.....1c
1 1/2x2 3/4x6..3 for 5c
3/4x1x8...2 for 5c
1x1 3/4x12.....9c

Thrust Bearings .025 and .035 hole each.....2c

Acetone Lge. 2 ozs. can 10c

Colored Dope Lge. 2 ozs. can 12c

Banana Oil Lge. 2 ozs. can 10c

Colorless Cement Lge. 2 ozs. can 16c

Jap Tissue For the commercial ship. Sheet 20 1/2 in. x 24".....5c

Model Tissue Sheet 21" x 29".....2 for 5c

Scientific Rubber .045 sq., 1/16 flat, 1/8 flat, and 1/4 flat 3 ft. for 1c

Insignia Stars in circle or bullseye. 1" dia....6 for 5c

Music Wire .014, .020, .028, .034, 18 ft.....5c

Celluloid Pants Pair.....25c

Celluloid Wheels with Bushings. Red, blue, yellow, white, green, black. 3/4" dia.... 6c pr. 1" dia.... 8c pr. 1 1/4" dia...11c pr. 1 1/2" dia...16c pr.

Rubber Air Wheels 1" dia...18c pr. 1 1/4" dia...20c pr. 1 1/2" dia...25c pr.

Reed 1/16", 1/8", 1/4", 6 ft.....5c

Add 15c to all supply orders up to $1.50; above $1.50, add 10%

GEE BEE SUPER SPORTSTER

The plane that broke all existing land speed records, travelling at the rate of 296 miles per hour. This new Scientific model looks just like the real ship. Here are the details: Wing span, 20"; Length, 14"; Weight 1¾ oz.; Colors, red and white. The Kit is most complete: Ribs, bulkheads, wing tips and other parts clearly printed on balsa; semi-finished propeller; all wire fittings ready formed; finished turned cowling front; (no bamboo to bend); 1 oz. banana oil and colored cement and special colored dope; tissue; rubber; all balsa strips cut to size, and of course full size plans and instructions..... **1.50 Post Paid**

Send for your Scientific kits NOW, and enter them in the Popular Aviation Model Contest. - - - THEY'RE WINNERS!

GEE-BEE Sportster-D Kit contains everything for a complete 2 ft. Flying Gee-Bee (essential parts printed on balsa). Full size plans and instructions. A model you will be proud to give or to receive. **1.25 P.P.**

MONOCOUPE-110 Complete with full size plans (necessary parts clearly printed on balsa), and everything to build a perfect 2 ft. Monocoupe. Build yours now and enter it in the Popular Aviation Contest. **1.25 P.P.**

15" FLYING SCALE MODELS, 99c ea., postpaid
SE 5 British Pursuit—Fokker Triplane—Spad —Lockheed Vega. Complete in every detail

Scientific Double Geared Ball-Bearing Winders, New, large size. **50c**

American Beauty Winders with automatic counters attached complete, Winder without counter 55c **3.50**

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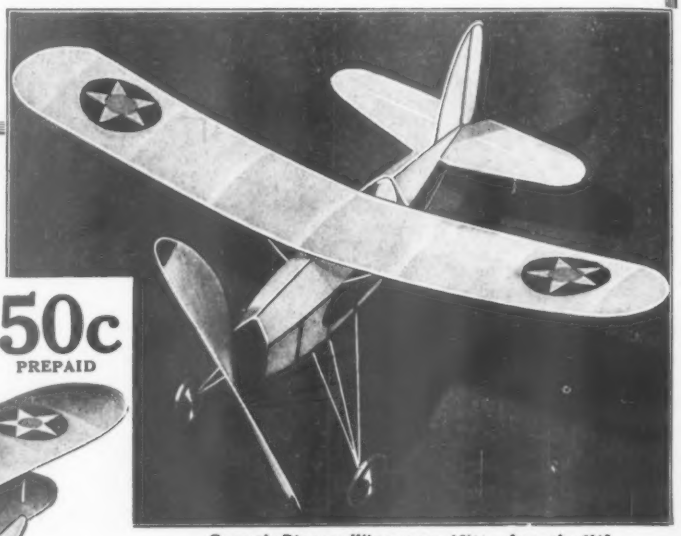
WORLD'S LARGEST MANUFACTURER OF MODEL AIRPLANE KITS AND SUPPLIES EXCLUSIVELY

"The boys of the club agree with me that

Your Company Can't Be Beat for SERVICE, nor Your Models for True Flyers!"

"The fact that your (Comet) models are designed for simplicity and flying quality sets your company apart from some others who either put out planes that are complicated jobs for experts, or are incomplete and no fliers at all. We have had experience with both and certainly appreciate your products. I wish to compliment your company (Comet) on its service and completeness of its kits!"—LLOYD GABRIEL, Mich. (Letter on file).

Note to Reader:—We are proud to print Mr. Gabriel's kind letter. It is one of many received from customers complimenting our quick service, completeness of kits, ease in building our planes, and telling of fine, thrilling flights. If you want thrilling FLIGHTS—a Free Glider and Free Catalog—order kits today, or tell Santa (dad) to order Comet Kits—on the "send no money" coupon!



Comet's Dipper: Wing span: 12½ — Length: 9½"

"Dipper FLEW 900 FEET"

"Received Comet Dipper, and it was packed the best and best material I ever saw! I easily built it and it flew over 900 feet its first flight!"—Rob't E. Latas, Colo.—(Letter on file).

EASILY, QUICKLY BUILT! This amazing blue-white Dipper rises off ground, flies like an eagle, weighs ¼ oz.—costs only 50c prepaid! Easily built like ALL Comet kits! COMPLETE kit packed in colored box, has rubber motor, Jap tissue, balsa "prop" blank, bamboo, wheels, wire parts, balsa parts, FULL SIZE 3-VIEW plans, banana liquid, cement, EVERYTHING needed. Thousands built, flown! FREE GLIDER included! Order on Coupon quick!

50c PREPAID

Christmas Gift De luxe NEW U. S. NAVY RACER

(In Silver Box!)

Beautiful red, blue and silver box (Xmas Gift Box) contains ALL materials, 3-view, FULL-size plans—**everything** you need to get the **biggest** thrill of your life—building, flying this sensational looking Navy Racer! Costs only $1.50 prepaid and you get FREE formed **Celluloid Prop**, and FREE Glider! Plane colored red, white, blue! Easily hand-launched **for land flying**—rises off water, too! Hurry! It's the **Xmas gift deluxe**! Tell dad or mother you WANT this kit! Or order NOW on Coupon! (Note: EACH Comet kit packed in beautiful, colored box!)

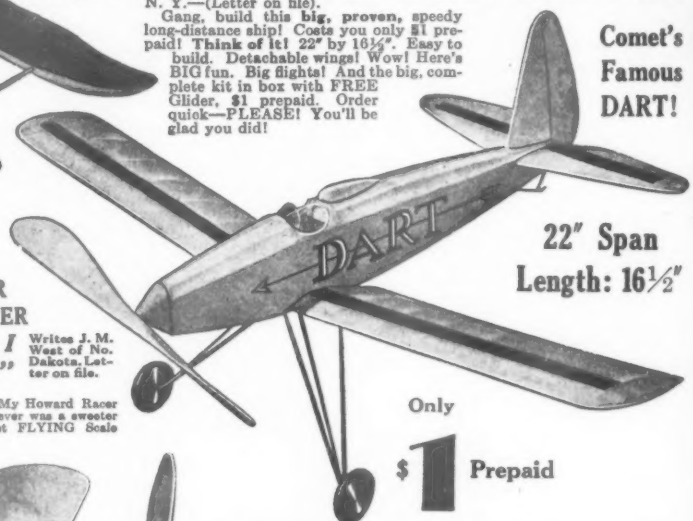
Only $1.50 Prepaid

"DART IS MOST PERFECT FLYING MODEL I EVER MADE! LONGEST FLIGHT 2000 FEET!"

"Our Comet Dart flew over 2,000 feet distance and over 150 feet altitude. It was also our **speediest model.** "EMIL VON CZERKAS and RAYMOND PAULIS. N. Y.—(Letter on file).

Gang, build this **big, proven,** speedy long-distance ship! Costs you only $1 prepaid! **Think of it!** 22" by 16½". Easy to build. Detachable wings! Wow! Here's BIG fun. Big flights! And the big, complete kit in box with FREE Glider, $1 prepaid. Order quick—PLEASE! You'll be glad you did!

Comet's Famous DART!



22" Span
Length: 16½"

Only $1 Prepaid

"MY COMET HOWARD RACER LOOKS AND FLIES BETTER *Than Any Scale Models I Have Made In 8 Years!"*

Writes J. M. West of No. Dakota. Letter on file.

And John Etherington of N. Y. writes, "My Howard Racer averages 750 feet per flight!" There never was a sweeter flying ship for the money than this Comet FLYING Scale Howard Racer! Get YOURS! COMPLETE KIT with ALL materials needed, 3-view, Full-size plans, etc.—only 75c prepaid in yellow-black box with FREE Glider! HURRY, order! Easy to build—like all Comet Kits!

75c Prepaid

LOOK!

Comet's New, F-a-s-t

RED RACER!

Wow! Speedy, beautiful, all-red color, gleaming black celluloid wheels—that's the Red Racer! A FREE Celluloid Prop included and Free Glider! COMPLETE kit costs only $1 prepaid. It's waiting for you inside brilliantly colored box. Get it! **Build it quickly, easily—and fly it!** Another **Comet triumph! Big FUN for you.** Order **TODAY. Full size, 3-view plans, of course! Order on Coupon!**

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"Thot my Dipper was wonderful, but the Curtiss Robin—Oh Boy! She flies 5 times as far! Hasn't landed on its back yet! Enclosing 75c for Howard Racer! —"HARRY MAGNI, N. Y. (Letter on file).

BUILD THIS AMAZING FLYING SCALE! Look! One of the surest fliers in the great Comet line! Dead easy to build—is 17½" x 14"—costs only $1 prepaid. Why not get this red, orange and black beauty—and fly it like Harry Magni did! A perfect Xmas gift! COMPLETE kit, full-size, 3-view plans, all materials, etc., sent you in big box, with FREE Celluloid Prop, and **runs** Glider! Order this bargain flyer today!

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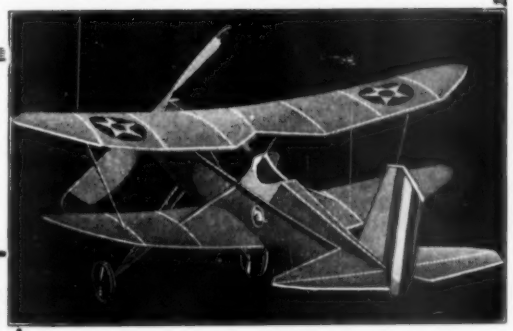
"Your service perfect—materials finest quality—models good-looking—prices very cheap—and the

BEST FLYERS I EVER SAW!"

Writes *Navaro Smith, Ohio Model Builder* (*Letter on File*)



NEW ARMY PLANE! "Your C-I Pursuit Made a RECORD FLIGHT For Me of 1300 FEET!"

"It was the easiest ship I ever constructed — the plans so easy to follow!" — Clyde Kowalka, Ohio. (Letter on File)

Looks like real biplane Army fighter with khaki fuselage, orange wings, red, white and blue rudder bars. Takes off, scuds thru the skies, makes 3-point landing. Easy to build. Thousands successfully flown! For a genuine thrill, get this C-I Pursuit right now!

Complete kit with ALL materials, 3-view, full-size plans, etc.—comes packed in big yellow-black box (photo below!)—only 75c prepaid. Free Glider included. Send Order-Coupon now!

75c PREPAID

Comet's C-I-Pursuit—Span: 15"—Length: 12¼"

EACH COMET KIT COMES IN BIG "GIFT" BOX, brightly colored. A perfect kit in a perfect box. Photo shows Pursuit box and partial view of kit contents.

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New sensational GLIDER Free with EACH kit you order! Loops, stunts! Also FREE: Remarkable 5-color, 24-page Catalog of Comet kits, supplies—Free with your order! ALSO FREE WITH EACH $1 and $1.50 KIT: The amazing NEW Celluloid Propeller invented by the Third man ever to FLY in U. S.! If you want this super-pull, realistic, already formed propeller invention for 50c and 75c kits, mark coupon. 5", 12c; 6" and 7", 15c each. Colors: Red, Green, Yellow, Chalk-white. They BANISH prop carving job!

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Do this!—buy, build and FLY the greatest low-price line of FLYING planes—made by COMET! We design each Comet plane SPECIALLY to fly—and how they do! The letters from model builders shown on these two pages are like many hundreds and hundreds of complimentary letters we get telling how far, how fine their Comet-crafted ships flew—and how EASILY built! Now fellows, you can buy with FULL CONFIDENCE because we give you back your money if you aren't satisfied with your kits! EACH KIT comes packed in beautiful, colored "gift" box—has COMPLETE kit materials, full-size, 3-view plans, etc. There's a FREE Glider in each kit, and a Free, new Celluloid "prop" in each of the $1 and $1.50 kits. Each kit is priced LOW yet gives more than FULL value. Order now in Groups of 3 (for Xmas gifts!) and SAVE CASH! Read below! Now!

SPECIAL Xmas Offer!

Read carefully—and SAVE CASH! Order now. Offer good limited time! Each Group saves you 25c! GROUP 1 consists of: Dipper (50c) Any 75c kit and any $1 kit. Total cost: $2.25. SPECIAL at $2 prepaid! GROUP 2 consists of: U. S. Navy Racer ($1.50) and any 75c kit. Total cost: $2.25. SPECIAL at $2 prepaid! 3 FREE Gliders with each group! One Free Celluloid "prop" with each Group! Mark, mail coupon—order convenient C. O. D. "Send no money" way—today! QUICK SERVICE GUARANTEED!

3 KITS Each in Gift Box $2

Think Of It! Only **$1** PREPAID

New Heath Baby Bullet!

Here's the first FLYING Scale Heath Baby Bullet to sell at $1 prepaid. FLY? You tell 'em. Like a bullet! Being Comet-crafted, you KNOW IT'S EASY TO BUILD—and beautiful! Blue, orange—smoothest FLYER you ever FLEW! Hurry! It's new. Get yours quick! COMPLETE "super-value" kit packed in modernistic colored box with Free Glider and Free Celluloid "prop"—only $1 prepaid. Be FIRST to build, fly—others will envy your flights! Boy, boy! Wait'll you see it! Order on Coupon!

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Order from your Comet Dealer Always—If you have no Comet Dealer—Order now Direct!

Order the convenient way—send no money—just mark, mail coupon! On delivery you pay postman for kits plus few cents postage, C. O. D. fee. Send cash and we pay postage! West of Mississippi, send 10c extra. Use money order. If check, add 15c for exchange. Canadians remit 20% extra. HURRY! Order C.O.D. or cash—before we withdraw Free Glider, celluloid "prop" and Cash-Saving Group offers!

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WRITE NAME OF KITS YOU WANT
You Save 25c per Group!
☐ GROUP 1: Dipper, (75c kit name:.....) ($1 kit name:.....)
☐ Group2: U.S.Navy Racer (75c kit name.....)
CELLULOID PROPS: Size.....Color.....
Quantity.....
Catalog, 3c stamp ☐

Airy Chat

(*Continued from page* 385)

the assistance of the law to sink the amateur, the very fellow who has kept the game alive all these years. They can't make a living themselves and they won't allow anyone else to try it. Big Business.

They detest plain John Smith but idolize the so-called "Sportsman-Pilot" with scads of boodle in his pocket who has taken a temporary vacation from polo to play around with airplanes. An occasional sale to the Sportsman-Pilot, in their opinion, is worth a 1,000,000 sales to the John Smiths of this country. Short-sighted, what?

* * *

AND Big Business has introduced the standardized technician, who up to this time has proved to be more or less of a joke so far as practical results are concerned. By limiting the privilege of design by law to a few men trained under their own specifications, Big Business holds the situation right in its own hands. Thus is created, an engineering aristocracy that rules the roost with a firm grip.

They do not wish a man with original thought. All thought must be standardized according to their own standards. And about all we get out of it is a good hearty laugh when these highly trained technicians market another flop.

* * *

WE have received a pathetic letter from the chaplain of Clinton Prison, Dannemora, N. Y., in which the chaplain tells of the great interest that his wards have for aviation. Though deprived of their freedom, they still like to read of aviation in the great outside world.

J. B. R.

Capt. Mollison's Puss Moth
"The Hearts Content"

14" Flying Model
A new sensation for all model builders. A most complete kit containing all necessary material with plans and instructions to make this flying model. Be among the first to fly a model of this internationally known plane. **99c** postpaid

The Thompson Trophy Winner **Gee-Bee Sportster**

Doolittle's Speed Record Breaker. Complete kit to make a perfect flying scale model. Gee-Bee. Easy to build. Accurate in every detail. Wing Span 14". A flying wonder. **99c** postpaid

Jimmy Haizlip's Wedell Williams

The plane that made the new transcontinental record at the National Air Races. Complete kit includes everything to make a perfect 14" flying model. **99c** postpaid

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Leslie Long

(*Continued from page* 360)

tous about the safety of these young men as pilots doesn't seem at all worried about what happens to them so long as they don't fly. The daily list of traffic fatalities is OK, but if one of them should happen to bark his ankle in a lightship the LAW calls on the Department of Commerce for punishment, as it points with sadness to the tragic lack of a magic "C" on the rudder.

If private flying is to survive such conditions must be changed. The only actual, lasting enthusiasm in the amateur aviation class is among the experimenters and builders. The wealthy youth who takes up flying invariably loses his interest in a short time. Therefore, the hope for a flying public lies in encouraging the experimenter, instead of forcing him out of existence.

As has been stated, the simplest method would be for the Department of Commerce to issue a special license to amateur constructors. This license must not require a stress analysis and preferably should not require any kind of examination, although this would not be of serious importance. After a lot of observation and study it would seem that such a license should be based on the following general outline.

The total maximum brake horsepower to be somewhere between 40 and 50. This at once prevents all danger of over-powered "stunt" ships, and includes all the present popular lightplane engines. The wing loading is not to exceed 5 or 5½ pound. per square foot. This to prevent high landing speeds and heavy stresses.

The mean aspect ratio to be not less than 5 nor more than 10. The distance from center of pressure to tail group hinges to be not less than 35 percent of span. The area of ailerons to be not less than 15 percent total area. Of vertical surfaces not less than 6 percent and of horizontal surfaces, 10 percent.

While a great many are going to disagree, it is the writer's opinion that for the good of all of us such a license should be limited to single place ships. This takes away the final argument of hurting the innocent passenger. A man should and must have the right to take chances with his own safety, but when it comes to someone's son or daughter who would probably have no idea of what is going on, it is a different matter. For the present, at least, we should be satisfied to do our flying solo.

A license, as outlined above, given with the provision that all flying is to be done from private fields and away from established airlines, could hurt nobody. It could and would be a positive life saver for private flying. If it could do any good, such ships might be inspected once or twice, the inspector to state his opinion of the job and suggest, not demand, such changes as he thought needed. Any sensible man would value these suggestions, if made in good faith.

If the Department could be prevailed upon to issue such a license it would settle the whole thing at once. As the chances are that it will not do it, the next thing for us is to have the various state boards adopt the plan. Every one of you who is interested should get in touch with your state legislators and appeal to their sense of fairness and business sense. Make them understand the actual facts and especially make them understand that the true percentage of accidents in these light ships is far less than in the over-powered licensed jobs.

We must use every effort. Some of the magazines are strongly and frankly opposed to us. They certainly do not deserve our support. The great majority of the schools and smaller commercial interests are strongly in favor of this idea. The ones who are not, certainly do not deserve our support. If we watch our chances and really try we can win this thing. If we don't we are sunk.

There is great need for low-cost technical help. If this magazine, for instance, had a department where for a nominal sum such information could be had it would mean a lot. It would save weeks of hunting eleswhere, as is now done. Tell the Editor what you think of this. Maybe he will do it.

The final summing up of all this is that we believe we have the right to work for our own interests and enjoyment in our own way, if it is not going to endanger others. We feel certain that the future of private flying lies in the interest of the young men of today, who are the business men of tomorrow.

We know that the finest type of young man we have is being driven out of his chosen work for no justifiable reason. Finally, to revert back to our old enemy "stress analysis," we know that the said analysis is inherently worthless and not worth the paper it is written on. Listen; if 40 Einsteins were to design a ship, one welder with a Monday-Morning headache could give it a safety factor of one—minus. You can't keep out the old human element.

Mr. Long has had extended experience in amateur aviation on the Coast, both in lightplane and engine building, and has made special investigation into the legal end of the sport.

Most Easily Built Model on Market
New Motor Gives Longer Flights

This realistic 12-inch model Sopwith Fighter will rise off ground and fly 150 ft. or more consistently. A steady flyer indoors or out. Set includes aluminum propeller, brass shaft, rubber band motor, streamlined wheels, nose-block ready-cut struts etc Clear building and flying directions. No tools needed. Simplified construction makes this most easily built model on market. Can be made in two hours and will give more real satisfaction than expensive sets. Mailed in unbreakable container, postpaid in U. S. and Canada, only 50c. Order yours today.
The Midland Model Works, Dept. V, Chillicothe, O.
(No stamps or C.O.D.'s. No catalogue. Please give full address.)

A Busy Pilot

(*Continued from page 362*)

he should be in Birmingham at 1 o'clock.

At 12:08 p. m. the Birmingham City radio operator calls him: "Calling Kindred in No. 33 O.K., Kindred?"

"Kindred in No. 33. Altitude 1,600 feet with ceiling closing in on me. I think I'm nearing your city. How does it look on the field? Go ahead?"

"Ceiling hasn't changed. Wind is same. What's your air speed?"

"Hundred and fifteen."

"You should be in in fifteen minutes. O.K."

At exactly 12:28 p. m. Kindred comes thundering down onto the field at Birmingham. Although it is still raining, for some reason the visibility is fair and the ceiling is still at 1,800 feet. While sacks of mail are being exchanged, the operator brings out a cup of coffee and talks over the weather.

KINDRED, who has been flying the air mail for six years, listens to this weather talk. 10,500 hours of flying have taught him that the weather is the one foe that will never be conquered. It is something that cannot be turned aside. Motor failure, fuel exhaustion are slight hazards besides the forces of nature.

At Birmingham, just before Kindred takes off, the rain ceases but the wind takes a sudden rise. Again things could not be much worse.

At 12:40 p. m. he reports his position to the Atlanta operator. Presently he begins to encounter the high wind. What is most alarming is the fact that the brace wires begin vibrating with a dangerous hum that can be heard nowhere else on earth or sky. The ceiling is fairly high and Kindred pulls back on the stick to climb out of the rain if possible.

The whole ship is vibrating from the force of the wind. At times, the propeller seems to be unbalanced. He climbs still higher, almost to the ceiling and is rewarded by hearing the vibration first die down and then cease altogether. He feels in luck and believes that if he can fly at this altitude for fifty minutes longer he will be in Atlanta.

At 12:55 p. m. he again reports to the Atlanta operator and is encouraged by the news that the wind is dying down. It is still raining. He is five hours out of Love Field and about 740 miles away from his starting point. He is thirty miles away from his destination. He picks up the welcome Atlanta message and is speeding on his way with an easier breath. At 1:05 p. m. he reports to his own station at Love Field again and then he swoops up to the station at his destination—at exactly 1:10 p. m.

Alighting, he runs for the rest that is awaiting him. Another pilot is ready and waiting for his arrival. As quickly as the mail sacks can be handed out of Ship No. 33, it is rolled into a hangar out of the driving rain to be overhauled and inspected while Pilot Kindred goes to his hotel for sleep. The pilot that picks up the relay? He will go through the rain just as safely and just as surely he will get Uncle Sam's mail there on time, too. For that is all just a part of the business.

Bad weather and foul, this is the daily routine followed by mailplanes on a dozen different airlines all over the United States. Schedules are met even with greater faithfulness than on the railroads, because airmail is "premium mail" for which an extra charge is made for prompt delivery.

END

KITS

15" Flying Scale Models

S. E. 5 Pursuit, Travelair Mystery Ship, Stinson Monoplane, Lockheed Vega, Lockheed Orion, Gee-Bee, Laird Supersolution, Curtiss Hawk P-6E, Curtiss Hell-Diver Ballanca Skyrocket, Fokker Triplane, Fokker Amphibian Nieuport Scout, S.P.A.D., "Chasseur," Boeing P-12B, Alsbatross D-III, Sopwith Camel, D. H. Tiger, Moth, Pfalz, P. Z. L. VI., Supermarine 6B, Gloster IV., Seaplane, Kits 75c each, 3 for $2.00. Kits sent postage paid.

1/32x2x18	Balsa....7 for 10c	Hokone Tissue, Red, White,
1/16x2x18	Balsa....7 for 10c	Blue, Green, Orange, Brown,
1/8 x2x18	Balsa....6 for 10c	Yellow, Black, 3 sheets, 10c
2 x4x36	Balsa.....45c	1/32 sq. rubber, 75 ft. for 10c.
2 x6x36	Balsa.....75c	3/64 sq. rubber, 50 ft. for 10c,
3/8x½x5	Balsa....8 for 5c	3/32 flat rub., 40 ft. for 10c,
⅛ x¼x5	Balsa....7 for 5c	⅛ flat rubber, 35 ft. for 10c

Add 15c for postage. Discount to Dealers and Clubs. Send 3c stamp for Price List.

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Build the new popular miniature solid scale models of ten famous planes!

Pfalz Scout	AC-1	S.E. 5	AC-2
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Camel	AC-5	S.P.A.D.	AC-6
Travelair Mys.	AC-7	Curtiss A-8	AC-8
Boeing P-12-C.	AC-9	Akron Fighter	AC-10

Models are 6 to 8" span, in proportion to scale

TRAVELAIR MYSTERY SHIP
Built from Arielcraft Kit AC-7

Each kit contains: Printed balsa parts, stamped balsa fuselage block, stamped balsa prop block, turned balsa wheels, one large and one small bottle of colored dope, cement, sandpaper, bushings, model pins, instruction sheet and full size blueprint. All packed in a strong attractive box.

45c each postpaid U. S. A.

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Send 3c stamp for our new big price-list bringing you the finest quality kits and supplies at America's lowest prices!

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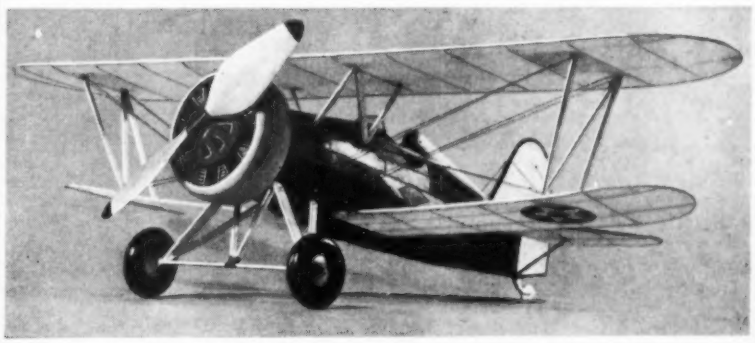
Actual Flying Model of the Army's Latest Battle Plane

NEW BOEING P-12E 24" Span 2 Ounces



BOYS! Here's a real beauty! And how she can fly! Perfect model, accurately scaled down from Boeing's famous new ship. Has all the quality and beauty of the big ship. This is actual photo. 24-in. wing span. Weighs 2 oz. Unusually durable. So EASY TO BUILD! Attractive Christmas Kit contains all wood parts cut to size, celluloid motor, new type celluloid wheels, shaped propeller block stamped ribs, shaped nose block and motor mount, star in circle and rudder stripes, all wire parts formed, tissue glue and dope—with full size drawings and easy clear instructions. EVERYTHING you need! Packed in sturdy box. Most complete kit ever offered at sensationally low price of only..... **$2.25** Postpaid

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Free with order. Otherwise, send 10c in coin to cover mailing. Illustrates many new models any boy can build quickly, easily. Send Now.

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Launching Models

(*Continued from page* 378)

left hand, hold the propeller to prevent it from turning. When launching the model for flight, release the propeller with your left-hand and then launch the model on a slightly downward angle with a gentle forward push with your right hand.

If the inside wing flies low and sideslips to the ground, warp the right end of the wing a little. This sideslip is caused by the torque of the propeller and warping of the wing serves to counteract the torque. If the outside wing tip flies low and starts to sideslip it is due to too much angle of incidence or to warping the right end of the wing.

If model climbs too steeply or stalls and does not show the tendency to sideslip either to the left or right the wing needs to be moved back a little. If the model does not climb very well and does not show any tendency to sideslip it means that the wing needs to be moved a little forward. Make these adjustments carefully to improve the flight of the model. If you want the model to fly in smaller circles than in previous flights, warp the right end of the wing.

Of course, with some indoor models, you can circle the model by bending the rudder. Remember you can make better model flights and have less breakage by gliding a model before flying it. When you obtained a good steady flight with the model the rubber may be wound up with a greater number of turns than you have given in your test flights for a longer duration flight.

END

Cold Weather Hints

(*Continued from page* 371)

For landing in and out of snow covered fields, let me cite two of my own experiences. Several winters ago I was about to take off from the Buffalo (N. Y.) Municipal Airport. Impatient to be off for an early start, I taxied my ship out of the hangar and after a full-gun test-out, I taxied up to what I thought was a smooth lane to take off on. Tracks in the snow showed where another airplane had taken off while I had been in the hangar.

The Airport Super stopped me and made me wait until two tractors had ploughed a clear lane into the wind. This lane was parallel to the tracks in the snow, but 100 yards to one side of them. The Super explained that the previous ship had skiis and was directed to where the snow was deep and even, while my ship with wheels, needed a lane in the snow where this snow was either swept away or packed down hard enough to run on with wheels. Another time, I was forced down by a snow storm at Pittsburgh. There were three ships in the air at the same time, two of us dragging the field while the third shivering pilot decided to come in to land without delay.

He sat her down where the white blanket of snow looked good and smooth and promptly nosed in to a fine deep snow bank, not hurting himself or his ship. The next ship, also with wheels, landed where the field looked ragged and patchy and made it fine as he had chosen a spot where the snow was thin and the dry ground showed through. I had skiis, but I came in too soon after No. 2 and the flurry of fine snow from his prop wash that greeted me almost caused me to run in to No. 1's tail group in my blindness.

Some years ago, two U. S. service flyers, invited to visit the Canadian Air Force at Camp Borden, came in to land with DeH's equipped with wheels. "High-ranking" went in first and promptly said "O-o-of", as his landing gear sank in four feet of snow. "Low-ranking" leered to himself and chose a spot where he could see the grass through the snow. Only it wasn't grass, but the tops of *six-foot* bushes poking through the snow. *He* didn't go "Oooof", he went "Crash!"

Moist, packing snow is fine except that it is apt to make lumps of ice on the landing gear and when the pilot starts up to take off after having rested his skiis in the snow for a minute or so, this snow will pack too quickly and retard his run for the first 100 feet or until his speed is about half take-off speed. Dry, sifting snow is generally best, although it has a bad habit of blowing into deep drifts in one spot and no snow at all in another.

Landing with skiis, however, is just as easy and "feathery" as landing a seaplane in moderately smooth water.

SNOW "blink" is a phenomenon encountered in the winter. Once when flying on the El Paso-Tucson route, a number of snow flurries to the North and South kept me right through Apache Pass, a bit West of Lordsburg, N. Mexico. The sun was brilliant, except for the snow-clouds. The pass was filled with fine light particles of snow from a cloud that had dissipated, but the wind through the pass kept the snow in the air. The bright sun rays were so refracted by this suspended snow so that all one could see was a bright, white glare although the snow wasn't particularly thick. It took two minutes of instrument flying to pull through it.

Another time, a fellow pilot was coming in to a Long Island field when a heavy snow fall trapped him. He had to fly by instrument, which gave him little trouble, except to maintain his compass course, for the bumpy wind was swinging his ship around a bit making it difficult to maintain the "turn" needle on the left of zero as much as on the right of it. The magnetic compass was oscillating badly. By occasionally looking behind and below, however, the pilot could see the ground down the lane of falling snowflakes through which he was passing. He saw Sandy Hook, then Romer Shoals Light, then Rockaway, then Cross-Bay Boulevard and so on until he "fudged" his course over to the Hempstead reservoir, after which the snow cleared.

If you leave your airplane out on the ice of a well frozen lake in a sleet storm because "it's all-metal and snow and ice can't hurt it" make sure the weight of the ice on the wings doesn't crack them, or else gently push the airplane down through the ice until its wings rest on the surface.

AND about ice on the wings and struts. They have instruments to warn you of such a condition, but a good $2.00 thermometer strapped to a strut will also do the trick. From 28° to 34° Fahrenheit in a drizzle of rain is ideal to cause ice formations. Regardless of inventions to counter such evils, none have been satisfactorily perfected or put on the market at a decent price.

Warming the engine presents other problems, but here the average flyer in Northern country has had experience with his auto engine. The average plumber's pot-furnace with a six-inch diameter canvas tube leading up inside the cowling where the warm air will get at the crankcase is a practical stunt for an easy starting of the engine, but care must be taken that no gas drips from the carburetor or the gas leads into this air duct.

A blow torch held against a can full of oil will warm it up readily, and although you will be warned many times that you are "scorching the life" out of the oil, you need only be careful that you stir the oil slightly and avoid boiling it to a froth.

Gobs of grease or old oil on the controls may cause them to stick at 40° below zero, particularly the aileron hinges. Use only "3-in-1" or other light oil for hinges in very cold weather.

The care of the person is also essential, for many a case of pneumonia has developed from a pilot being clad in winter flying togs, getting all "het up" in starting his engine, then going up for a flight where the cold air seeped through his suit and got at his open pores. A cold blast on an unprotected forehead will cause a severe headache, but this is the least of it, for serious sinus trouble is apt to develop.

Frosted goggles are also a nuisance and more care must be taken to ventilate them than in the good old summer time. Leave the elastic a bit slack, but be sure to tighten it up when poking your face outside the windshield or a case of frozen eyes may result.

As night-flying is different than day-flying, so is winter flying different than that in warm weather. It's more bother to get started, you have to be more careful and a change to skiis may cost a little, but no pilot can claim really varied flying experience unless he too gets out and gets his nose nipped at 30 or 40 below.

END

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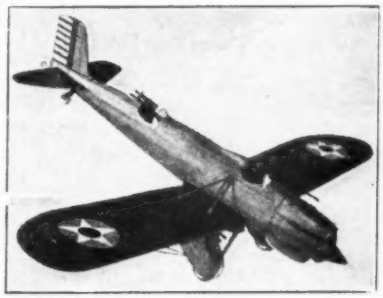

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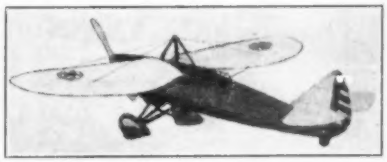

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Meteorology

(*Continued from page 370*)

Florida, seven inches of rain in Seattle, a blizzard raging in Butte, 96 in the shade in Arizona and northwest storm warnings over the Great Lakes. What-a-country!"

It's a fact, Jim—I've seen a good pilot do it. It may take you several hours—or days—to be able to tell which way the wind is blowing in Boise, Idaho, but you'll soon learn.

Suppose we take a look at a weather map, Jim. You'll notice that reporting stations are indicated by means of a small circle. Certain data is entered at each station circle, all of which your faithful instructor will endeavor to explain.

Before doing so, however, I want you to note the three sets of lines drawn on the map. The black broken lines are *isotherms*, drawn through stations of equal temperature—at intervals of ten degrees Fahrenheit.

The red and blue lines (solid line in illustration) are *isobars*, drawn through areas of equal barometric pressure. Blue isobars indicate pressures of 29.90 and under; red ones, pressures of 30.00 and over.

The one-barb arrow at the station circle represents wind direction, the arrow pointing in the direction toward which the wind is blowing. The station circle itself is used to convey information.

If it is clear, the circle is left clear. If partly cloudy, the circle is half shaded. If cloudy, the entire circle is shaded. Rain is indicated with an R within the circle; snow with an S.

In order to keep things all ship-shape on the weather map, it is necessary to have uniform system of classifying and entering data. The following order is adhered to in making up the map, and, if I am not overtaxing your mental equipment unduly, I suggest you also memorize the order of entries.

1. Name of station.
2. Wind direction.
3. State of weather.
4. Temperature.
5. Barometric pressure.
6. Maximum or minimum temperature.
7. Wind velocity.
8. Amount of precipitation.
9. Two-hour pressure change.
10. Thunderstorms.
11. Cloud form, amount and direction of movement.
12. Maximum wind.

Now, Jim, if you'll get out a weather map you will find all the hen-tracks plain sailing in the light of these entries. If the station circle is clear, and the arrow points south, the weather at that station is clear, with a north wind.

The top figure at the station, say 74, indicates the temperature. The next, say 29.96 indicates the barometer stands at 29.96. It is sometimes the practice to eliminate the first figure in the interests of brevity. The third figure from the top is the wind velocity in miles per hour.

The next, the precipitation in inches and hundredths. Special markings include thunderstorm symbols, cloud symbols, abnormal two hour pressure changes, maximum wind velocities and precipitation markings in yellow or orange crayons. Fog is indicated with red crayon shading. General rains are shown by a light shading of green.

From these brief facts you may think that making a weather map is easy, Jim, and that to read one is a cinch. You will be wrong, as usual, for there is a pile of work in making a good map, and a lot of experience and weather knowledge necessary to read one correctly.

Because this business of mapping the weather is all-fired important to aviation, our benevolent government spends a great deal of time and quite a lot of money in doing the job right. Probably no other country on the face of the earth can boast as fine a weather bureau as ours, Jim, and it will pay you well on many an occasion to glue that beak of yours to the map every chance you get, until you can read 'em in the dark, so to speak.

If possible to do it in my next letter I'll elaborate some on the details of the weather map, in spite of my urge to get on with this series of lessons into the more advanced stages of meteorology. Anyway, here's hoping!

Meanwhile, let's hear from you as to the progress you are making. Give my regards to the gang. And don't forget that at least one of us is taking this course seriously.

Yours,

Charley.

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Propellers

(*Continued from page 374*)

ber that pitch times r.p.m. will be close to your flying speed.

A FACT not always recognized is that nearly all high speed engines will give better results at speeds less than their maximum. Take the Henderson for example. A properly made propeller of the correct pitch which is large enough to hold the engine to about 2,600 r.p.m. will give far better performance than one which will allow it to turn at 3,000. We have never seen this fail.

We have often used propellers so large that the motor would turn but 2,400, and these would cruise beautifully at but 2,000, which is quite low for this motor.

Due to the high rotative speeds of most lightplane engines, the blade form of the propeller is important. The thinner the blade, the higher the efficiency. Thinning a blade ⅛ inch will usually add about 200 r.p.m. For this reason un-tipped propellers are always best, unless the tipping is countersunk. All wooden blades should be as thin as safety will permit.

It may seem surprising, but we have never seen a lightplane propeller over six months old that had both blades of the same pitch. This, of course, means more or less serious vibration. If your engine seems to vibrate more than it should, or you are troubled with cracked motor mounts—check the pitch. The sketches show one of the best and simplest ways.

Make up the angle tester of two pieces of ¼ in. by ½ in. wood. The short piece (B-B) about a foot long and the other (C-C) about 3 feet long. Put a small machine screw at the hinge. The pieces must be perfectly straight. Mark both blades off in lengths of around five inches.

Lay the propeller across a box or barrel and place a straight piece of wood (A-A) squarely across the hub. Lay the tester on one of the pencil marks and sight along the tops of the two long sticks till they are exactly parallel. Go to the corresponding mark at the other end of the propeller and see if the angle is the same.

IF YOU find the propeller out of pitch you should rectify it. If not seriously out of pitch, it may be shimmed up in the hub. Carefully shaving the hub on one side is another method. If too far out for fixing in this way it is far best to discard it as dangerous. Balance is also important, and if not perfect, should be remedied with paint or varnish, or possibly plugging with lead, which should be done by an experienced workman.

To sum up, if you are not getting what you think you should out of your ship—look to the propeller. Use as large diameter as possible, even if it means a rather narrow blade.

Have a pronounced washout of pitch in the inner sections of the blades. Don't use metal tipping unless necessary. Check frequently for pitch and balance. Finally, always remember that a properly made propeller is a marvelous piece of apparatus and that it is the most important part of your ship.

END

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4. The names and numbers of the winners will be published in our future advertisements.
5. Orders which are received too late for this month's drawing will be eligible for next month. This contest continues until further notice.

1st	Prize $5
2nd	Prize $2
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⅞" dia... 8c ea.	2" dia...30c pr.	1½" dia...16c pr.
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	1¾" dia...30c pr.	**Balsa Wheels**
	1½ or 1⅝" w. 40c pr.	**Bal. Tire Shape**
	2" dia...40c pr.	½" dia... 5c pr.
		¾" dia... 6c pr.
		1" dia... 7c pr.
		1¼" dia... 8c pr.
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3½"..25		3½"..20	
4"..30	4"..35	4"..25	4"..30
4½"..35	4½"..45	4½"..35	4½"..40
5"..35	5"..50	5"..40	5"..45
5½"..40	5½"..60	6"..35	6"..60
6½"..40	6½"..70	6½"..45	
7"..55	7"..80	6¾"..50	7"..70
8"..65	8"..90	8"..60	8"..80
9"..75	9"..1.00	9"..70	9"..90
10"..85	10"..1.10	10"..80	10"..1.00
11"..95	11"..1.25		
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2½"	.28	.30	.30
3"	.30	.35	.35
3½"	.40	.45	.45
4"	.50	.55	.55
4½"	.75	.80	.75
5"	.90	.95	.90
5½"	1.05	1.10	1.05
6"	1.25	1.30	1.25
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Monoxide Gas

(*Continued from page* 362)

Heating the cabin by liquid circulation should be quite safe and, of course, has been used extensively in ships having water-cooled motors, but with air-cooled motors the liquid involves some additional weight and cost.

The Department of Commerce, whose duty it is to see that safety of passengers is guarded, will investigate this accident which almost wiped out two of our best radio engineers in aviation (Schnell and Nichols) but it is not the policy of the Department to publish its findings so you will have to draw your own conclusions.

It should be noted that carbon monoxide is a deadly poison that will coagulate the blood corpuscles, and does not merely suffocate the victim as do other gases. Once the blood is so affected, it can never be restored by any known treatment. A pulmotor has practically no effect where even a slight concentration of the gas has entered the blood stream.

END

The Pc-7 Ship

(*Continued from page* 366)

ing and the radiators for both water and oil are located on the upper surfaces of the wings.

The motor is geared to a speed of 2,600 r.p.m. and as the air propeller is of considerable size, this means that its tip moves with a velocity near that of sound. This necessitated the construction of a special propeller, whose tips are uniformly convex, practically symmetrical and extremely thin. This follows the principle of a projectile, the resistance of which is much diminished when the entering curve is at its sharpest. A special brake insures that the propeller will halt in a horizontal position and thus avoids damage from the water on landing.

On the first trials of the Pc-7, the instability at low speeds was easily overcome by the pilot as had been forseen and several brief flights were made. No official timing devices were used but extraordinary speeds were obtained. Unfortunately, the clutch of the marine propeller, which had worked perfectly during block trials and when it was tried in an experimental motor-boat built for the purpose, became deluged with oil and developed violent vibrations. Dr. Pegna and his associates are now studying methods of overcoming this difficulty, and the Pc-7 is expected to take the air again within a month or two.

She has only 91 sq. ft. of wing surfaces and carried a total weight of 3717 pounds, including full tanks. The calculated speed of the machine is in the neighborhood of 375 miles per hour.

END

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National Kits with blueprints and instructions are complete in every particular. National features: Correct colored tissue, and insignia, strips cut to size.—ribs, stations and other important parts are clearly printed on balsa, making them easy to cut out. Formed wire parts, rubber, cement, pants and wheels according to type of plane.

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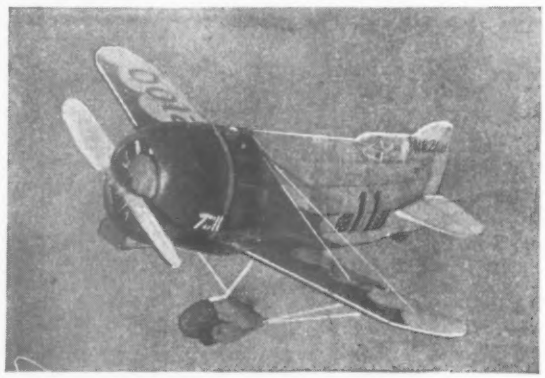
Winner of the 1932 Thompson Trophy Race piloted by Major James Doolittle at the terrific speed of over 300 M.P.H. Look at its huge round stubby body. Its windshield and rudder are different from last year's ship. See how its pilot sits right over the tail.



National engineers have designed two perfect miniature scale models. A ½" scale model with 12½" wingspread and a 1" scale model, 25" wingspread. Both kits contain several exclusive National features. The models are designed to build a reinforced fuselage just like the truss welded tube frame of the big ship. The new moulded, feather weight, non-breakable cowling, is the same shape and color as the big ship. It is ready to cement to fuselage. Both models have the new multi-powered motor to give them good flying ability. Colors: Red and white, with insignia as shown.

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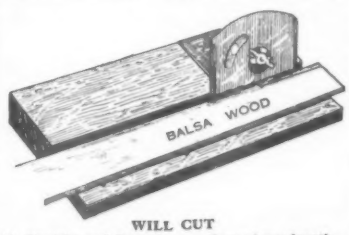

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XUM

Ford "A" Engines

(*Continued from page* 374)

into two parts. And again, it will not be necessary to take care of the crankcase after you remove the oil pump, providing you cut the oil drain pipe off on the front main bearing.

Either a new or used Ford "A" engine can be converted. A used engine will be O. K. if it is in good condition, but if the cylinder bore is out of round it must be honed and put in good shape before you go further. If out of round, the bore will give trouble when it becomes necessary to use the engine at full power, even for a short length of time. The pressures are much higher in the cylinder when it is used at half or full throttle than in the automobile, and as a result, there will be oil pumping and similar troubles if the proper clearance is not held between the cylinders and the pistons.

With a new engine, all of these troubles are eliminated, and also the expense of the necessary repairs. While a second-hand engine can be obtained at a much lower price than a new one, yet the repairs and replacements will often bring the cost up to a point where you wish that you had started in with a new engine.

After all these matters have been attended to, take the engine all apart, and clean every part thoroughly. This gives an excellent opportunity for carefully inspecting each part for defects or wear. In particular, inspect the bore and pistons for roundness and fit, and carefully examine the piston rings. In the case of a used engine, it does not do much good to install new rings if the cylinders are much worn or out of round.

When buying a used Ford engine, see how it acts in the car, if possible, before taking it. I assume that you are all familiar with this engine and with automobile engines in general, so I will not go very far in outlining this inspection. Note if the engine is "oil-pumping", that is, if there is much oil slop around the spark plugs and gaskets, and if much blue-white smoke (oil smoke) appears at the exhaust. It is unwise to purchase an oil pumper, or an engine whose running indicates that the bearings are badly worn.

Burned out bearings, due to lack of oil in the engine, are always a possibility in buying a used engine, and this is easy to detect from the pounding when the engine is pulling hard. Connecting rod rattle at high speed and no load may call for more work and expense, so this matter should be investigated before taking over the engine. There are many points of this nature to look into, or you will annex a lot of extra trouble and work for yourself. The safest bet is a new engine.

It is understood, of course, that the transmission, the transmission bell-housing and the flywheel must be removed as they are not necessary when the engine is installed on the airplane. The exhaust manifold is also removed, and the carburetor requires some explanation.

Now, the regular Model "A" carburetor works very well, with some exceptions, if an air-warmer is put around the first exhaust stack (stub exhaust pipes used in place of the manifold), but if your field is rough, they have a tendency toward causing missing during take-off. And there is also a tendency for the gasoline to start leaking out of the carburetor during a steep glide, but there is no use of worrying too much about this trouble under ordinary flight conditions.

But it is best, however, to use the new Model "B" Ford carburetor which does not have any of the troubles mentioned above. This new carburetor works so much better, and is so much safer, that it is best to pay the small price asked for it and benefit by the change.

In the next issue of POPULAR AVIATION, I will give a detailed account of converting the crankshaft, fitting the magneto connections, converting the camshaft, making other alterations.

END

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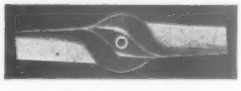

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Super-Planes

(*Continued from page* 354)

The crash of the R-100 in France was the last straw. Hence, it is only reasonable to believe that many of the super-planes that will be constructed by the English in the future will be designed with an eye to their military possibilities.

From this brief survey of super-planes, it seems apparent that the immediate future for such creations rests almost entirely with the military designers. The smaller 20 to 30-passenger machines will continue to hold the limelight on the commercial stage for some time. Airline operators will not adopt bigger planes until they can be shown that such a move will mean greater profit to them. At present, and for some time in the future, aerial travel will easily be handled with present moderate-sized equipment.

"SUMMING everything up," Mr. Stout remarked, "I am afraid that the giant airplane, so called, is a dream of the engineer who has not checked the dividend figures with his flying characteristics and crew requirement. Up to forty or fifty passengers, a plane can be made thoroughly practical from an engineering standpoint for airline use. Whether commercially practical or not depends, as it would with a steamboat or bus, on the actual route on which it is to be used."

It might be well to emphasize this fact: That the future of aviation will develop out of the commercial success of flying and not from the mere engineering feat of flying larger and faster machines.

END

Dog Fight

(*Continued from page* 352)

sponsibilities. One of the pilots of his flight was a novice, Lieutenant May, on his first flight over the lines. Brown had warned the fledgling no matter what happened to stay out of a dog-fight. He was to watch, but not to take part.

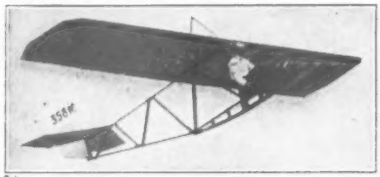
With serious eyes Brown scanned the ceiling but saw nothing. His alert eyes searched the 15,000 foot expanse beneath him to the ground. Nearly two miles beneath him Brown saw two slow-flying photographing planes of an antiquated model—R. E. 8's. He knew there were four men from the 3rd Australian Squadron in those two planes.

The British planes were nearing Hamel. So was Richthofen and his comrades. Neither saw the other. But Richthofen saw the two clumsy R. E.'s down below.

Quick as a flash, four red Fokkers went roaring down. The flashing red tripes bolted straight at the unprotected photographic planes to box them in. When this was done, down came Richthofen like a flaming meteor for the kill.

The Australian observers were working desperately the rear Lewis machine guns. Then down came more Fokker triplanes. Their red wings flashing crimson threats of blood that was to be shed.

FROM a point two miles above, Brown saw the avalanche descend upon the two slow planes. In an instant he signaled, right-ruddered and sent his Camel down in a terrific power dive. Behind him came seven pilots of his flight. One of the two pilots who remained aloft was Lieutenant W. R. May. He



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was obeying his captain's orders to keep out of a dog-fight. The other pilot was having difficulty with his engine.

Fokkers were milling around the R. E.'s like wasps ready to sting. Came a formation of Albatrosses from out of the near-noon sun. Brown counted twenty-two planes bearing the Maltese Cross insignia of the German Imperial Air Force harrassing the gallant foursome of Australian airmen. More were above and off to one side. Eight Camels and two R. E. 8's against twenty-two Fokkers and Albatrosses. Odds of more than two to one!

The moment the Camels dove into the fray with machine guns belching lead and tracers, the Germans veered off. This brief instant gave the R. E. 8's a chance to dive and escape. Angered by being deprived of his easy victories, Richthofen rallied his comrades in a furious attempt to wipe out the British Camels.

Racing, roaring, screaming, the planes banked, dove, zoomed and whirled about. The dog-fight was on! And with each successive breath-taking maneuver, the cyclonic whirlwind of planes lost altitude. Nearer and nearer to the ground they came.

Soon they were fighting right over the trenches, in one mad furious struggle to wipe as many planes out of the sky as possible. No quarter was shown. This was a dog-fight to the finish. Richthofen, the pet of the Kaiser, a little demi-god of the German Air Force, had been foiled in his attempt to get two more easy victories. Such things could not be.

BUT there was a violent east wind blowing and the Germans were not accustomed to this—neither were the British. The prevailing winds are from the west to the east, which, all during the war, favored the Germans and hindered the British. The west winds gave the Germans a good tail wind to assist them home. And, as this dog-fight continued the swirling cloud of roaring planes were carried by the wind towards the British 4th Army's lines.

Then Richthofen caught a Camel in his ring sights. His twin Spandaus flashed flames. The Camel dropped, then glided to the west aided by the wind. Richthofen went down after the disabled Camel, missed his last thrust, zoomed and climbed around the milling planes to a great height. Here, from his new point of vantage, he watched the dog-fight and bided his time to go plunging down on another victim. Down below, Lieutenant Wolff—one of Richthofen's comrades—pounced upon a Camel and sent it down.

The British pilots took heart as an Albatross went down in flames when the tracer bullets of Lieutenant Taylor's Lewises found the German's gas tank. A triplane tumbled out of the sky, a victim of Lieutenant Mackenzie's accurate marksmanship. Another followed as Lieutenant F. J. W. Mellersh caught the pilot dead in his sights. Three Germans down and two Camels out of the fight! The dog-fight raged on.

Brown dived upon a Fokker. It zoomed straight up in the air. Although his Camel was a marvel for fast climbing, Brown sideslipped. Two planes were upon his tail. Brown looped, half-

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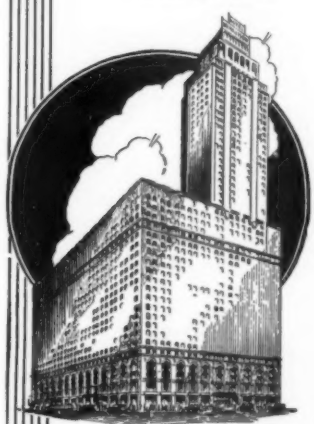

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rolled and found himself directly behind two Fokkers.

But that zoom was to change the whole war for Brown. It was also to strike the death blow into the very heart of the German Air Force.

Lieutenant May, the novice pilot from Australia, unaware of the Richthofen threat idling above him, had been thrilled by the fight he had witnessed. He saw Brown making after the two Fokkers. Then, like all fledglings anxious to get a German on his first hop over the lines, May impulsively thrust his stick forward and went down to assist his captain just as he came out of the half-roll.

But May never got his man. With the speed of a thunderbolt the unseen red tripe came screaming down out of the battle skies. May didn't know it, but he was being attacked by the "Bloody Baron" who had killed a hundred men.

WHEN May saw the cowling before his eyes shot away, he glanced back, saw Richthofen's plane and did exactly as his captain had told him. He slammed the stick against the instrument board, kicked the rudder hard into the corner, went down in a wild attempt to spin out of descending death's path. When May came out of the spin, he looked back. The nose of the little three-winged red Fokker was still on his tail!

He was too near the ground to go into another spin. He dived toward the trenches, zig-zagged to right and left; now diving, now zooming to keep the Bloody Baron from getting in a fatal burst. The Australian youth realized his inability to shake the German pilot off his tail. This unknown pilot was a master at the controls—May a novice.

May jerked the stick back into his belly. The nose of his Camel snapped up. For a sheer thousand feet it climbed nearly vertically, then over on its back it went. May rolled, and came out in an Immelmann turn. But there was the red Fokker still relentlessly stalking him to his death. May knew he must go down. He side-slipped, gunned the motor and cut for the shell-torn ridge behind the British lines.

Less than 1,000 feet above, Captain Roy Brown saw the red triplane on May's tail. He sensed in one fleeting glance that his fledgling pilot was doomed. Brown nosed his Camel over and down he went in a terrific power dive with wide open throttle.

Off to the right, above the ruined village of Sailly-le-Sec, Brown saw a Camel. The hump-back was going down in a spin. Two Fokkers had riveted themselves to the tail of it. But the Camel was still under control. Lieutenant Mellersh, victor over one Fokker, was being forced to spin down to earth to save his life.

May, too, evidently saw Mellersh pull out of the spin and land safely. He made for a spot near the Camel on the ground. But Richtofen's Spandaus were again belching deadly twin streams of destruction. A searing pain burned up May's right arm. A Spandau bullet found his small body. The instruments before his eyes clattered to broken bits as bullets whizzed past his helmeted head. A strut snapped under the impact of a burst of lead.

MAY made for the Australian lines ahead on the ridge. Not over 200 feet above the heads of the soldiers he vaulted the 53rd machine gunners' nest. A third plane joined May and Richthofen, making a tandem formation. Brown was now on Richthofen's tail. And Richthofen, intent upon getting May, did not know a brace of Lewis machine guns were pointed at him from behind.

Coming out of his power dive, the Canadian pilot had taken up a position on the red triplane's tail from which he was not to be shaken. Brown hadn't the slightest idea who the German was. All Brown knew was that one of his pilots was in dire distress and Brown had a record that he was justly proud of—he had never lost a man on a patrol over enemy territory. He didn't intend to see this enviable record broken. He had to kill the German pilot on May's tail to save his young pilot's life.

With capable hands, sure legs and clear eyes he redressed his ship. His nose was too high. He lowered it. Now the black helmeted head of the German pilot swayed in his ring sights. Brown pressed the trips. The triplane's course altered.

Instead of getting the German Brown saw his tracers and bullet holes marching like soldiers in single columns along the fabric-covered fuselage. He redressed his ship. Now the bullet holes march relentlessly, accurately, straight towards the pilot.

They were down another hundred feet by now. A terrific rifle and machine gun fire broke loose from the ground forces below. A leaden hail showered upward towards the German plane. Brown followed the red Fokker down. He saw May skim over the trenches and make good his escape.

Brown kept his sights trained on the

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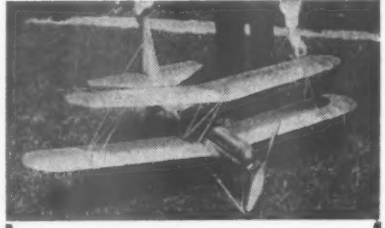

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pilot of the Fokker. His Lewises were red hot from constant firing. The Fokker crossed the trenches and settled easily to the ground.

Overhead, Fokkers and Albatrosses were in a death struggle with the remaining Camels. The German pilots saw their leader go down. Appalled by the unbelievable sight they hi-tailed it for home to report the unbelievable information that Baron von Richthofen was seen to land behind the British Army's lines.

The Australian machine gunners claimed they had shot the Baron down. When his leather flying jacket was open, the medical officers found Richthofen wearing blue silk pajamas. Two bullet holes were in his chest. After the examination, the medical officers agreed that the one bullet that had caused instant death had entered the body at such an angle that it was impossible for it to have been fired from the ground. This greatest of all single victories was then rightfully given to the Air Corps, but the controversy has waged for years since.

Brown later landed at his field where he found May waiting to express his gratitude to Brown for saving his life. The amazed riggers and mechanics gazed at Brown's plane. It was riddled with no less than half a hundred bullet holes and only half the cylinders of his motor functioned.

* * *

I HAVE written this description of this famous dog-fight only after a considerable amount of research, conferences, interviews and a great deal of correspondence with eye-witnesses. From the data collected I have reconstructed this particular dog-fight.

I found that no one eye-witness of the fight could give me all the details of the Brown-Richthofen battle. It took many sources of information to make this article possible. This is proven by Captain Roy Brown's laconic report alone. I give it here, word for word, which was written shortly after he landed and before he was aware he had become the outstanding hero of the Royal Air Force.

DATE: *April 21, 1918.*

DUTY: *High patrol.*

ENGAGEMENT: *With red triplane—Fokker.*

LOCATION: *Vaux sur Somme.*

TIME: *About 11 A. M.*

At about 10:35 I observed two Albatrosses burst into flames and crash.

Dived on large formation of fifteen to twenty Albatross scouts, D.5's, and Fokker triplanes, two of which got on my tail, and I came out.

Went back again and dived on pure red ***triplane which was firing*** *on Lt. May. I got a long burst into him, and he went down vertically and was observed to crash by Lieutenant Mellersh and Lieutenant May. I fired on two more but did not get them.*

(Signed) A. R. Brown, Captain,
209 R.A.F. C. H. Butler, Major.

I have stated that in a dog-fight it is every man for himself. But in this particular set-to Brown not only took care of himself, but aided two R.E.8's to escape and thereby saved the lives of four airmen besides saving Lieutenant May. This is heroism of the highest order, to say nothing of the service Brown performed by winning his thirteenth and last victory over the greatest killer the German Air Force ever had.

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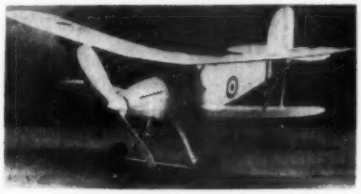

HAWKER "FURY"

What I Think About Airplane Bombers—Gen. Mitchell

(*Continued from page* 350)

thought if one bomb trap stuck, the other might not. At the first attack, the 1100-pound bombs sped straight to their mark, hitting just in front of the after turret on the battleship. Immediately she was enveloped in black smoke from the TNT for about four minutes.

As the smoke cleared, the observers saw, to their astonishment, a helpless hulk whose whole top had been completely sheared off. It was leaking at every seam, gradually turning over on its port side, then bottom up, then down by the stern to Davy Jones' locker. Within five minutes after this hit the ship was gone.

The other battleship still remained afloat. I only had a couple of bombs left. I told Lt. George to take his airplane out and sink the vessel. George made a couple of runs over the target, fired just one shot and then came back. The vessel sank within two minutes.

WHEN we say that aircraft can sink battleships of any kind, we know what we are talking about. We can prove it at any time necessary. We know the uselessness of anti-aircraft artillery. We know we can destroy a fleet by surrounding it with a heavy gas curtain. We know that our aerial bombs can tear to pieces any ship that has ever been built or that can be built.

A committee of officers from the War and Navy Department, of which Gen. Pershing was chairman, found at the conclusion of our bombardment test that "aircraft acting from shore bases or sheltered harbors have the offensive power to sink any battleship that has been built or probably any that can be built."

One terrible weapon remains which the Navy does not like to talk about and which troubles them in their dreams. It is the underwater automobile torpedo with the magnetic nose by which it is drawn straight to a battleship's bottom. This weapon can be discharged at a distance of four or five miles from a ship. Its accuracy is very great. When it gets under the battleship, it is pulled right up into it by magnetism and hits the vessel in its most vulnerable place. Aircraft can launch these torpedoes better than any other agent.

In addition to gas bombs and torpedoes, aircraft can employ gliding bombs that have wings on them. They can be directed by gyroscopes and by radio telegraph straight to their mark. The air torpedo, which is really a little airplane in itself, is set by gyroscopic controls to maintain a certain direction and go a certain distance. It can also be controlled by radio.

The last three shots I tried with one of these was with Lawrence Sperry in 1922. They were fired from Garden City, L. I., to Trenton, N. J., a distance of about 70 miles. Each shot went straight to its target—the middle of the city. These air torpedoes can be made to fly clear across the Atlantic Ocean without the touch of human hands.

The Mt. Shasta has been the only ship bombed since 1923. For a space of nine years, our air forces have failed to develop their weapons for attack against seacraft."

Being the subject of so much misleading propaganda by the Navy and because of the many obstacles drawn about this test by its opponents, the attack upon the Mt. Shasta is well deserving of the special attention paid to it in my second article which will appear in the next issue of POPULAR AVIATION.

A SECOND informative article by Gen. Mitchell, giving the true facts in the bombing of the Mount Shasta, will be a feature of the January issue of POPULAR AVIATION.

In this article, Gen. Mitchell will uncover many startling facts heretofore not released to the public. Watch for this remarkable story.

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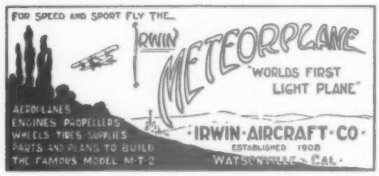

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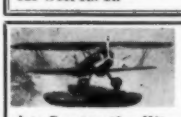

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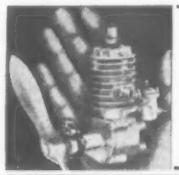

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Long distance reception. Highest quality parts used. Model B-3. Two-tube loudspeaker set. Pentode and Screen Grid tubes. 2,000 mile radius. Without batteries, tubes or speaker, price $3.00.
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Howl Dept.

(*Continued from page 370*)

During the last year, at the Franklin Tech Institute, I made a lengthy stress analysis of the Church mid-wing and found it to have a safety factor ranging from 4.0 to 11.0. Satisfactory, what?

* * *

HERE is a combined howl and yodel from John Gluck, Lock Box 14, Kiamesha, N. Y. Mr. Gluck not only howls, but makes specific suggestions, and that's something in these days.

It is with considerable interest that I read your magazine and what is more to the point, join the rest of The Howlers in protesting against the present license situation.

I have built the greater part of a Pietenpol Air Camper and find that I shall never be able to fly it. I have been informed officially by the Federal Supervising Inspector that the part of the N. Y. State Aviation Laws which would allow planes to be flown for test by the builder within a radius of ten miles of its base, have been taken out of the act. Also that an experimental license could be given to the original designer, Mr. B. H. Pietenpol but not to me nor the others who have been building these planes in this state.

I would suggest that pressure be brought to bear on those who could help to revise the laws. I would suggest that a special license be created to care for the home-built planes providing certain conditions were satisfactorily met.

It's pretty tough to be already to go and then have John Law slap down the lid.

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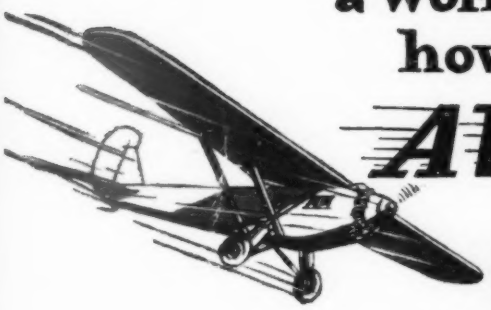

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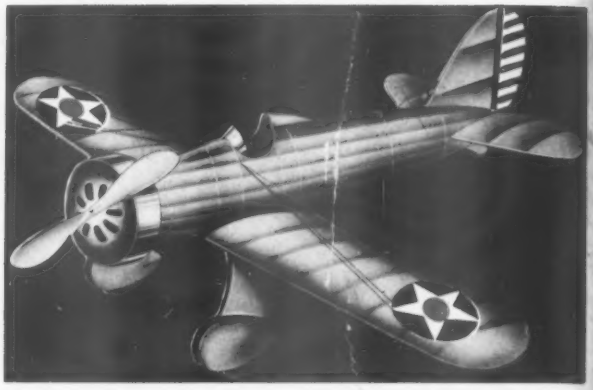

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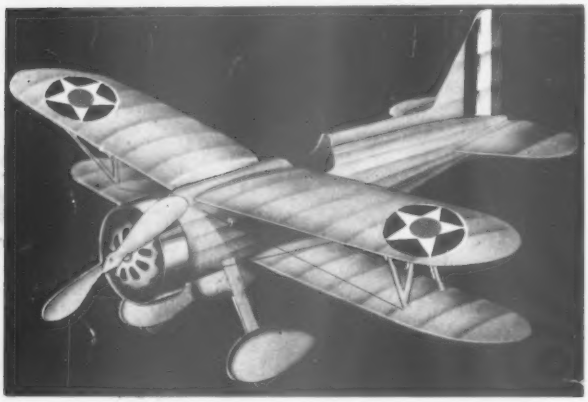

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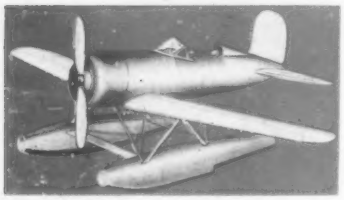

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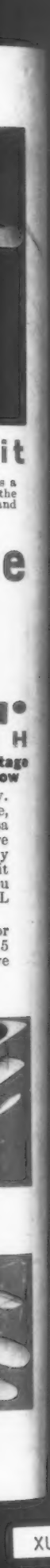

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